BECKHOFF New Automation Technology

Documentation | EN

EPP1518-0002

2-channel up/down counter 24 V DC, 1 kHz, 32 bit

Table of contents

1   Foreword

1.1   Notes on the documentation

Intended audience

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning these components.
It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement.

No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

Trademarks

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Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702 with corresponding applications or registrations in various other countries.

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1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of instructions

In this documentation the following instructions are used.
These instructions must be read carefully and followed without fail!

⚠ **DANGER**
Serious risk of injury!
Failure to follow this safety instruction directly endangers the life and health of persons.

⚠ **WARNING**
Risk of injury!
Failure to follow this safety instruction endangers the life and health of persons.

⚠ **CAUTION**
Personal injuries!
Failure to follow this safety instruction can lead to injuries to persons.

NOTE
Damage to environment/equipment or data loss
Failure to follow this instruction can lead to environmental damage, equipment damage or data loss.

ℹ   **Tip or pointer**

This symbol indicates information that contributes to better understanding.

1.3 Documentation Issue Status

Version	Comment
1.1	• Technical data updated • UL requirements updated • Dimensions updated
1.0	• First release Derived from documentation EP1518-0002, version 2.2.

Firmware and hardware versions

This documentation refers to the firmware and hardware version that was applicable at the time the documentation was written.

The module features are continuously improved and developed further. Modules having earlier production statuses cannot have the same properties as modules with the latest status. However, existing properties are retained and are not changed, so that older modules can always be replaced with new ones.

The firmware and hardware version (delivery state) can be found in the batch number (D-number) printed on the side of the EtherCAT Box.

Syntax of the batch number (D-number)

WW YY FF HH

WW - week of production (calendar week)
YY - year of production
FF - firmware version
HH - hardware version

Example with D no.: 55 09 01 00:

55 - week of production 55
09 - year of production 2009
01 - firmware version 01
00 - hardware version 001

Further information on this topic: <u>Version identification of EtherCAT devices [▶ 52]</u>.

2 Product group: EtherCAT P Box modules

EtherCAT P

EtherCAT P supplements the EtherCAT technology with a process in which communication and supply voltages are transmitted on a common line. All EtherCAT properties are retained with this process.

Two supply voltages are transmitted per EtherCAT P line. The supply voltages are electrically isolated from each other and can therefore be switched individually. The nominal supply voltage for both is 24 V_{DC}.

EtherCAT P uses the same cable structure as EtherCAT: a 4-core Ethernet cable with M8 connectors. The connectors are mechanically coded so that EtherCAT connectors and EtherCAT P connectors cannot be interchanged.

EtherCAT P Box modules

EtherCAT P Box modules are EtherCAT P slaves with IP67 protection. They are designed for operation in wet, dirty or dusty industrial environments.
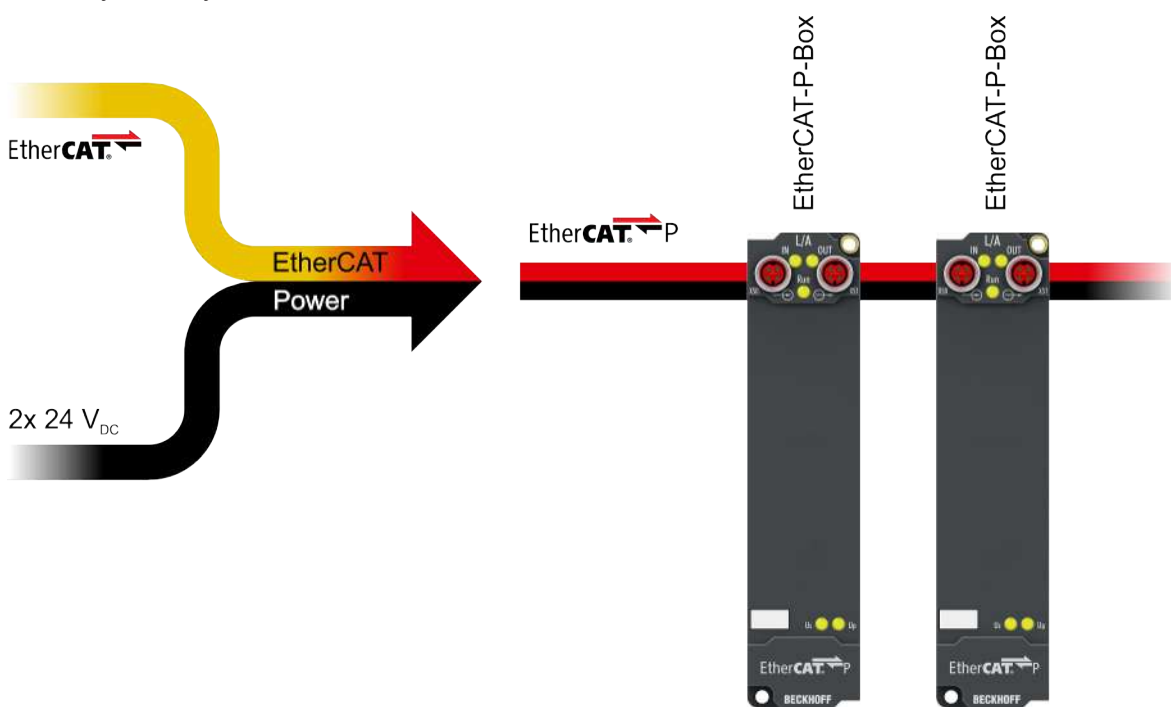

Fig. 1: EtherCAT P

> **ℹ️ EtherCAT basics**
>
> A detailed description of the EtherCAT system can be found in the <u>EtherCAT system documentation</u>.

3   Product overview

3.1   Introduction

EtherCAT P input

EtherCAT P downstream connection

Digital inputs
Counter inputs

1 | Tx+ / GNDs
2 | Rx+ / GNDp
3 | Rx- / Up
4 | Tx- / Us

1 | +24 V Us
2 | Input B
3 | GNDs
4 | Input A
5 | n.c.
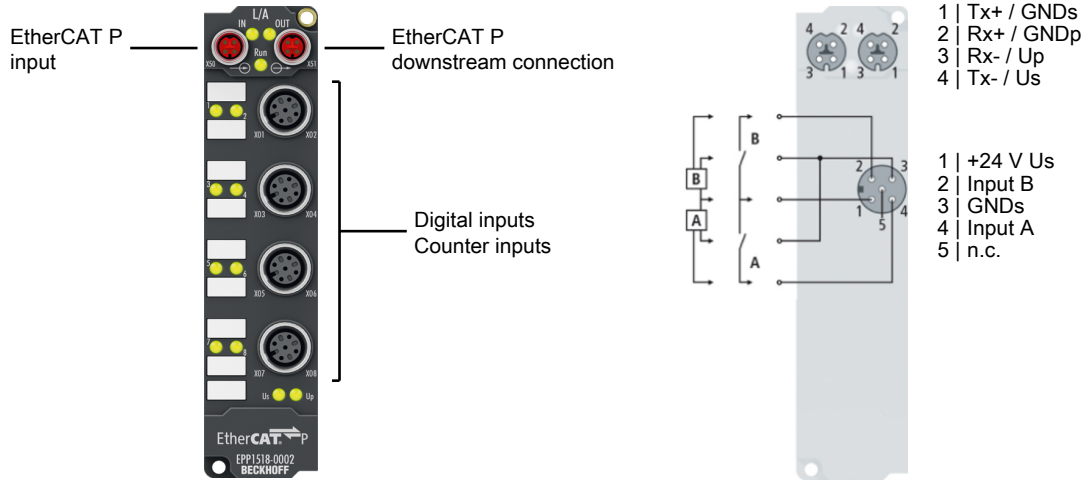
The EPP1518 EtherCAT P Box with digital inputs acquires binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signal state is displayed by light emitting diodes. The signals are connected via M12 screw type connectors. The input filters can be set between 0 and 100 ms via EtherCAT. Inputs 1 and 5 can be used as 32-bit up/down counters.

The sensors are supplied via the control voltage U_S in two groups of four sensors each. Any short circuits on the sensor side are detected and reported to the controller.

Quick links

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3.2 Technical data

All values are typical values over the entire temperature range, unless stated otherwise.

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red
Distributed Clocks	yes

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor supply (current consumption of connected sensors)
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	
Number	8
Connection	4 x M12 socket
Characteristics	Type 3 according to EN61131-2, compatible with type 1
Input filter	ajustable: 10 µs … 100 ms
	Counter inputs: 150 µs
Signal voltage "0"	-3…+5 V
Signal voltage "1"	+11…+30 V
Input current	3 mA
Sensor supply	from the control voltage U_S, short-circuit proof
	• max. 0.5 A for X01 and X02 in total
	• max. 0.5 A for X03 and X04 in total

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25…+60 °C -25…+55 °C according to cULus
Ambient temperature during storage	-40…+85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional checks [▶ 11]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals	
Approvals	CE, cULus [▶ 21]

Additional checks

The boxes have been subjected to the following checks:

Verification	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EtherCAT P Box EPP1518-0002
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

**ⓘ** **Pre-assembled protective caps do not ensure IP67 protection**

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.4 Process image

The process image depends on the selected operation mode [▶ 29].

Operation mode: 2 counters and 2 digital inputs (delivery state)
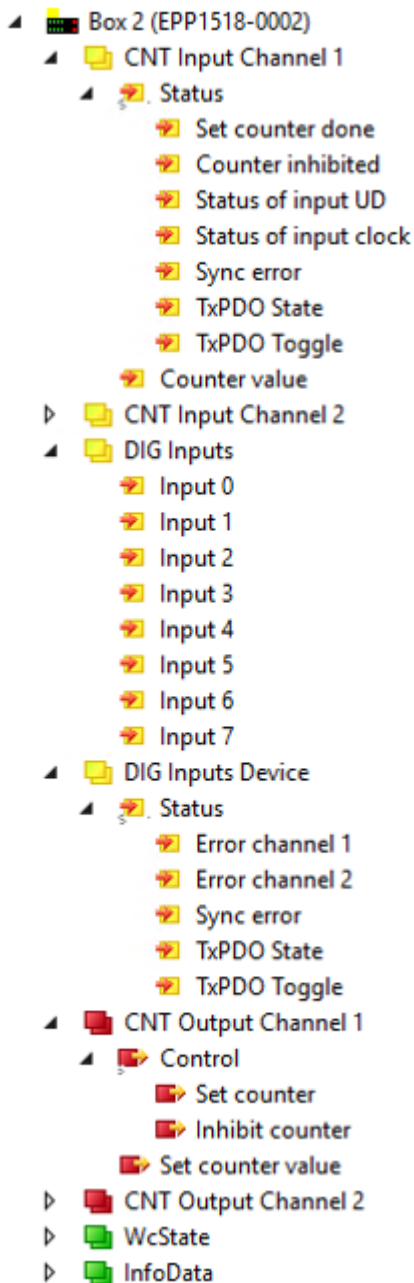
- Box 2 (EPP1518-0002)
  - CNT Input Channel 1
    - Status
      - Set counter done
      - Counter inhibited
      - Status of input UD
      - Status of input clock
      - Sync error
      - TxPDO State
      - TxPDO Toggle
    - Counter value
  - CNT Input Channel 2
  - DIG Inputs
    - Input 0
    - Input 1
    - Input 2
    - Input 3
    - Input 4
    - Input 5
    - Input 6
    - Input 7
  - DIG Inputs Device
    - Status
      - Error channel 1
      - Error channel 2
      - Sync error
      - TxPDO State
      - TxPDO Toggle
  - CNT Output Channel 1
    - Control
      - Set counter
      - Inhibit counter
    - Set counter value
  - CNT Output Channel 2
  - WcState
  - InfoData

The input data of the 1st counter can be found under **CNT Input Channel 1**.

- **Set counter done** indicates the transfer of the **Set counter** bit from **CNT Output Channel 1**.
- **Counter inhibited** indicates the transfer of the **Inhibit counter** bit from **CNT Output Channel 1**.
- **Status of input UD** shows the status of the Up/Down counter input of the 1st counter.
- **Status of input clock** shows the status of the input clock input of the 1st counter.
- Sync Error, TxPDO State and TxPDO Toggle are standard EtherCAT process data.

The input data of the 2st counter can be found under **CNT Input Channel 2**. Its structure corresponds to that of the first counter.

DIG Inputs shows the states of the individual inputs irrespective of the selected operation mode. Assignment of port names to variable names [▶ 14].

DIG Inputs Device

- **Error channel 1** indicates a short circuit of the supply voltage U_S at the digital inputs X01 to X04.
- **Error channel 2** indicates a short circuit of the supply voltage U_S at the digital inputs X05 to X08.

The output data of the 1st counter can be found under **CNT Output Channel 1**.

- The setting of **Set counter** activates the adoption of the **Set Counter Value** into the **Counter Value** of the 1st counter.
- The setting of **Inhibit Counter** disables the 1st counter. Alternatively the counter can be disabled or enabled by the physical GATE input.
  The two values are XORed.

The output data of the 2nd counter can be found under **CNT Output Channel 1**. Its structure corresponds to that of the first counter.

Operation mode: 1 counter and 5 digital inputs
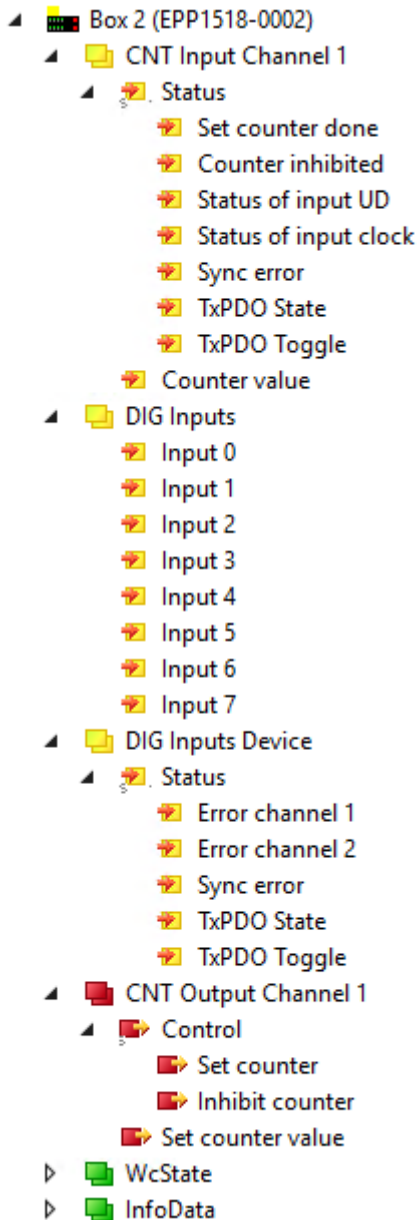
- Box 2 (EPP1518-0002)
  - CNT Input Channel 1
    - Status
      - Set counter done
      - Counter inhibited
      - Status of input UD
      - Status of input clock
      - Sync error
      - TxPDO State
      - TxPDO Toggle
    - Counter value
  - DIG Inputs
    - Input 0
    - Input 1
    - Input 2
    - Input 3
    - Input 4
    - Input 5
    - Input 6
    - Input 7
  - DIG Inputs Device
    - Status
      - Error channel 1
      - Error channel 2
      - Sync error
      - TxPDO State
      - TxPDO Toggle
  - CNT Output Channel 1
    - Control
      - Set counter
      - Inhibit counter
    - Set counter value
  - WcState
  - InfoData

The input data of the 1st counter can be found under **CNT Input Channel 1**.

- **Set counter done** indicates the transfer of the **Set counter** bit from **CNT Output Channel 1**.
- **Counter inhibited** indicates the transfer of the **Inhibit counter** bit from **CNT Output Channel 1**.
- **Status of input UD** shows the status of the Up/Down counter input of the 1st counter.
- **Status of input clock** shows the status of the input clock input of the 1st counter.
- Sync Error, TxPDO State and TxPDO Toggle are standard EtherCAT process data.

DIG Inputs shows the states of the individual inputs irrespective of the selected operation mode. Assignment of port names to variable names [▶ 14].
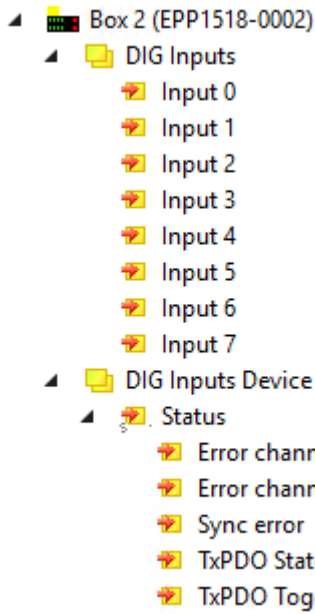
DIG Inputs Device

- **Error channel 1** indicates a short circuit of the supply voltage U_S at the digital inputs X01 to X04.
- **Error channel 2** indicates a short circuit of the supply voltage U_S at the digital inputs X05 to X08.

The output data of the 1st counter can be found under **CNT Output Channel 1**.

- The setting of **Set counter** activates the adoption of the **Set Counter Value** into the **Counter Value** of the 1st counter.
- The setting of **Inhibit Counter** disables the 1st counter. Alternatively the counter can be disabled or enabled by the physical GATE input.
  The two values are XORed.

Operation mode: 8 digital inputs

▲ Box 2 (EPP1518-0002)
  ▲ DIG Inputs
      Input 0
      Input 1
      Input 2
      Input 3
      Input 4
      Input 5
      Input 6
      Input 7
  ▲ DIG Inputs Device
    ▲ Status
        Error channel 1
        Error channel 2
        Sync error
        TxPDO State
        TxPDO Toggle

DIG Inputs shows the states of the individual inputs irrespective of the selected mode. Assignment of port names to variable names [▶ 14].

DIG Inputs Device

- **Error channel 1** indicates a short circuit of the supply voltage U_S at the digital inputs X01 to X04.
- **Error channel 2** indicates a short circuit of the supply voltage U_S at the digital inputs X05 to X08.
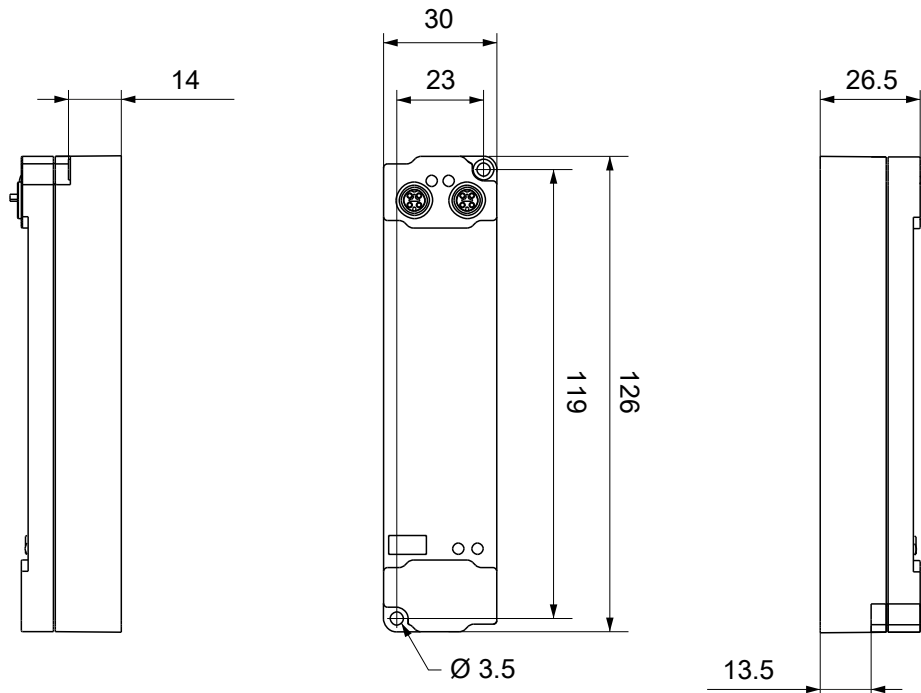
3.4.1 Assignment of port names to variable names

Connection	Pin	Variable in "DIG Inputs"
X01	4	Input 0
X02	2	Input 1
X03	4	Input 2
X04	2	Input 3
X05	4	Input 4
X06	2	Input 5
X07	4	Input 6
X08	2	Input 7

4   Installation

4.1   Mounting

4.1.1   Dimensions

All dimensions are given in millimeters.
The drawing is not true to scale.

Housing features

Housing material	PA6 (polyamide)
Sealing compound	polyurethane
Mounting	two fastening holes Ø 3.5 mm for M3
Metal parts	brass, nickel-plated
Contacts	CuZn, gold-plated
Installation position	variable
Protection class	IP65, IP66, IP67 (conforms to EN 60529) when screwed together
Dimensions (H x W x D)	approx. 126 x 30 x 26.5 mm (without connectors)

4.1.2   Fixing

NOTE
Dirt during assembly
Dirty connectors can lead to malfunctions. Protection class IP67 can only be guaranteed if all cables and connectors are connected.
• Protect the plug connectors against dirt during the assembly.

Mount the module with two M3 screws on the fastening holes in the corners of the module. The fastening holes have no thread.

4.1.3   Tightening torques for plug connectors

Screw connectors tight with a torque wrench. (e.g. ZB8801 from Beckhoff)

Connector diameter	Tightening torque
M8	0.4 Nm
M12	0.6 Nm

4.2 Connection

4.2.1 EtherCAT P

NOTE
Risk of damage to the device!
Bring the EtherCAT/EtherCAT P system into a safe, powered down state before starting installation, disassembly or wiring of the modules!

NOTE
Pay attention to the maximum permissible current!
Pay attention also for the redirection of EtherCAT P, the maximum permissible current for M8 connectors of 3 A must not be exceeded!

4.2.1.1 Connectors

Fig. 2: Plug connectors for EtherCAT P

1 - input

2 - downstream connection

Connection
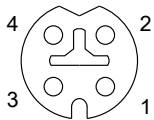
Fig. 3: M8 socket, P-coded

Contact	Signal	Voltage	Core color [1]
1	Tx +	GND_S	yellow
2	Rx +	GND_P	white
3	Rx -	U_P: Peripheral voltage, +24 V_{DC}	blue
4	Tx -	U_S: Control voltage, +24 V_{DC}	orange
Housing	Shield	Shield	Shield

[1] The core colors apply to EtherCAT P cables and ECP cables from Beckhoff.

4.2.1.2 Status LEDs
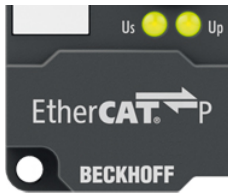
4.2.1.2.1 Supply voltages

Fig. 4: Status LEDs for the supply voltages

EtherCAT P Box Modules have two LEDs that display the status of the supply voltages. The status LEDs are labelled with the designations of the supply voltages: Us and Up.

A status LED lights up green when the respective supply voltage is present.

A Status LED lights up red if the respective supply voltage is short-circuited.

4.2.1.2.2 EtherCAT

Fig. 5: Status LEDs for EtherCAT

L/A (Link/Act)

A green LED labelled "L/A" or "Link/Act" is located next to each EtherCAT/EtherCAT P socket. The LED indicates the communication state of the respective socket:

LED	Meaning
off	no connection to the connected EtherCAT device
lit	LINK: connection to the connected EtherCAT device
flashes	ACT: communication with the connected EtherCAT device

Run

Each EtherCAT slave has a green LED labelled "Run". The LED signals the status of the slave in the EtherCAT network:

LED	Meaning
off	Slave is in "Init" state
flashes uniformly	Slave is in "Pre-Operational" state
flashes sporadically	Slave is in "Safe-Operational" state
lit	Slave is in "Operational" state

Description of the EtherCAT slave states

4.2.1.3   Conductor losses

Take into account the voltage drop on the supply line when planning a system. Avoid the voltage drop being so high that the supply voltage at the box lies below the minimum nominal voltage.

Variations in the voltage of the power supply unit must also be taken into account.

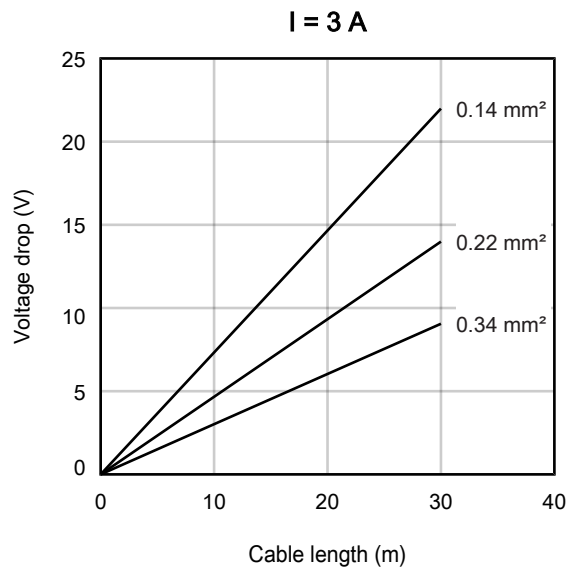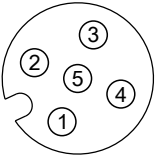Use the planning tool for EtherCAT P in TwinCAT.

Voltage drop on the supply line
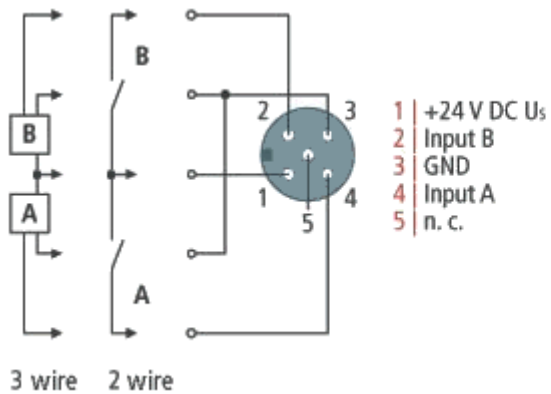

Fig. 6: Voltage drop on the supply line

4.2.2 Signal connection

Pin assignment

| M12 socket	Pin	Symbol	Function
	1	+24 V Us	Sensor supply
	2	Input B	Digital input
	3	GND	Ground
	4	Input A	Digital input
	5	n.c.	-

Use the sensor supply at pin 1 as supply voltage for connected sensors. Specifications [▶ 10].

Connection examples

3 wire   2 wire

Status LEDs

Each M12 socket has two green LEDs. An LED lights up when a high level is detected at the respective input.

Input A   Input B
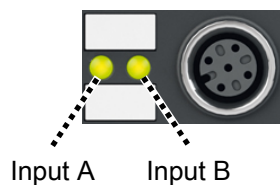
4.3 UL Requirements

The installation of the EtherCAT Box Modules certified by UL has to meet the following requirements.

Supply voltage

⚠ **CAUTION**
CAUTION!
This UL requirements are valid for all supply voltages of all marked EtherCAT Box Modules! For the compliance of the UL requirements the EtherCAT Box Modules should only be supplied • by a 24 V_{DC} supply voltage, supplied by an isolating source and protected by means of a fuse (in accordance with UL248), rated maximum 4 Amp, or • by a 24 V_{DC} power source, that has to satisfy *NEC class 2*. A *NEC class 2* power supply shall not be connected in series or parallel with another (class 2) power source!

⚠ **CAUTION**
CAUTION!
To meet the UL requirements, the EtherCAT Box Modules must not be connected to unlimited power sources!

Networks

⚠ **CAUTION**
CAUTION!
To meet the UL requirements, EtherCAT Box Modules must not be connected to telecommunication networks!

Ambient temperature range

⚠ **CAUTION**
CAUTION!
To meet the UL requirements, EtherCAT Box Modules has to be operated only at an ambient temperature range of -25 °C to +55 °C!

Marking for UL

All EtherCAT Box Modules certified by UL (Underwriters Laboratories) are marked with the following label.

Fig. 7: UL label

5   Commissioning and configuration

5.1   Integration in TwinCAT

The procedure for integration in TwinCAT is described in this Quick start guide.

5.2   Distributed Clocks (DC)

> ℹ️ **EtherCAT System Documentation**
>
> A basic introduction to the topic of EtherCAT and Distributed Clocks is available in the Download area on the Beckhoff homepage: EtherCAT System Documentation.

The Box supports the distributed clocks functionality. In order for the Box to provide the current counter reading before the arrival of the querying EtherCAT datagram in the specified process data, a corresponding signal must be generated cyclically in the Box. This signal can be triggered in the Box by two events: the SyncManager (SM) and the distributed clock (DC). Under operation mode selection the following options are available (see Fig. *"DC" (Disributed Clocks) tab*)

- **SM-synchron**
  The SyncManager event occurs when an EtherCAT frame successfully exchanges process data with the Box. Frame-triggered, the current counter value is thus cyclically determined, but with the low temporal jitter of the Ethernet frame.

- **DC-synchron**
  In DC operation mode determination of the counter value is triggered cyclically at constant intervals through the integrated DC unit, synchronous with the bus cycle as standard. More uniform polling offers higher-quality position data for a higher-level control algorithm, for example.
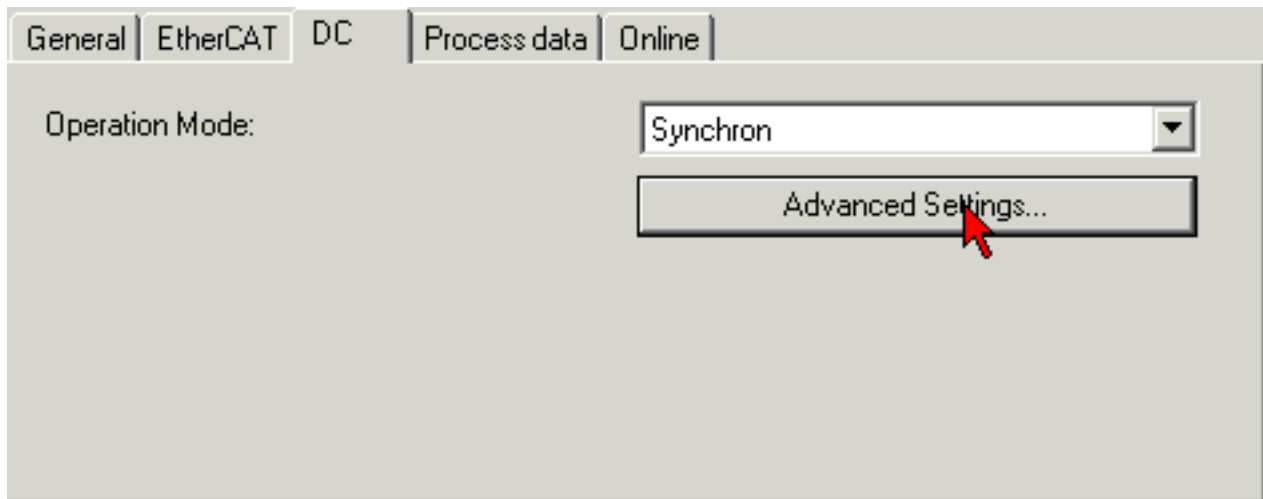 The trigger for the counter reading is the SYNC0 signal.

Fig. 8: DC tab (Distributed Clocks)

When *DC-Synchron* operation mode is activated TwinCAT selects settings that ensure reliable operation of the Box with current position data. This means that determination of the current counter value is triggered by the SYNC0 signal at highly constant intervals and in good time (i.e. with an adequate safety buffer) before retrieving EtherCAT datagram is started.

If necessary, the SYNC0 signal can be shifted along the time axis to the right/later or left/earlier in associated dialogs by specifying a user-defined shift time, see Fig. *Advanced Distributed Clock (DC) settings*.

- A right-shift (positive shift value) will delay the counter value query, which means the position value becomes more current from the PLC perspective. However, this increases the risk that the position determination may not be finished in time before the arrival of EtherCAT frame, so that no current position value is available in this cycle.

- A left-shift (negative shift value) means the counter value will be queried earlier, resulting in older position values, with an associated increase in the safety buffer before the arrival of the EtherCAT datagram. This setting may be useful in systems with high real-time jitter, if no Industrial PCs from Beckhoff are used for control purposes, for example.

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NOTE
Risk of device damage
The mentioned notes and information should be used advisedly. The EtherCAT master automatically allocates SYNC0 and SYNC1 settings that support reliable and timely process data acquisition. User intervention at this point may lead to undesired behavior. If these settings are changed in the System Manager, no plausibility checks are carried out on the software side. Correct function cannot be guaranteed for all conceivable setting options.

Default setting

The cyclic reading of the inputs is triggered by the SYNC0 pulse (interrupt) of the DC in the EtherCAT Box. The EtherCAT master sets the *Sync Unit Cycle* time value to the PLC cycle time and therefore the EtherCAT cycle time as standard. See Fig. *Advanced Distributed Clock (DC) settings*: 4000 µs = 4 ms, as TwinCAT is in configuration mode.
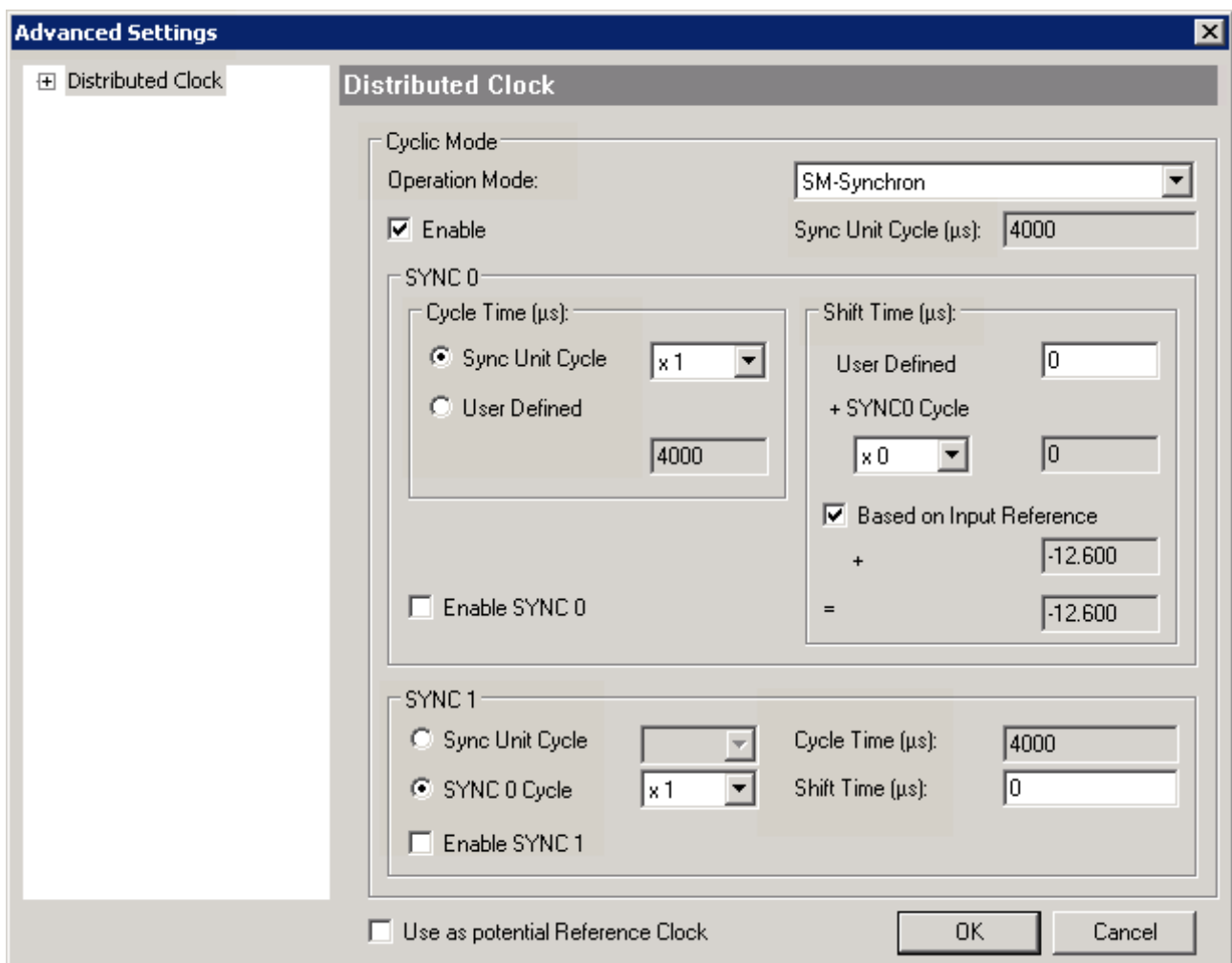
DC settings

Fig. 9: Advanced settings for Distributed Clocks (DC)

SYNC0

Sync Unit cycle: a multiple of the bus cycle time. The counter value is periodically determined at this interval (in µs).

User defined

Any number up to 2^{32} ns, or about 4.3 seconds. Use of decimal points is allowed.

Shift Time

The Shift Time can be used to shift the SYNC0 pulse for this EtherCAT Box relative to other Boxes/Terminals and the global SYNC pulse in nanosecond steps. If the inputs of several Boxes are read simultaneously, the same value must be entered here.

Based on input reference

If this option is activated an additional Input Shift is added to the configurable terminal-specific SYNC0 shift (user defined). This value is calculated and made available by the EtherCAT master (SysMan/Device EtherCAT/Tab EtherCAT/Advanced Settings/Distributed Clocks/Input Shift Time). As a result, *all* input terminals in the system (EL1xxx, EL3xxx, EP1xxx, EP3xxx, EPP1xxx, EPP3xxx) read in their inputs as shortly as possible before the EtherCAT frame is fetched, so that controller can be supplied with input data that is as current as possible.

Enable SYNC0

Automatically activated in *DC-synchron* operation mode.

SYNC1

Additional SYNC pulse, derived from SYNC0 or from the DC itself.

DC settings for EtherCAT master

Higher-level distributed clock parameters can be modified under advanced settings for the EtherCAT master. Refer also to the basic introduction to the topic of EtherCAT and Distributed Clocks; download: the Distributed Clocks system description.
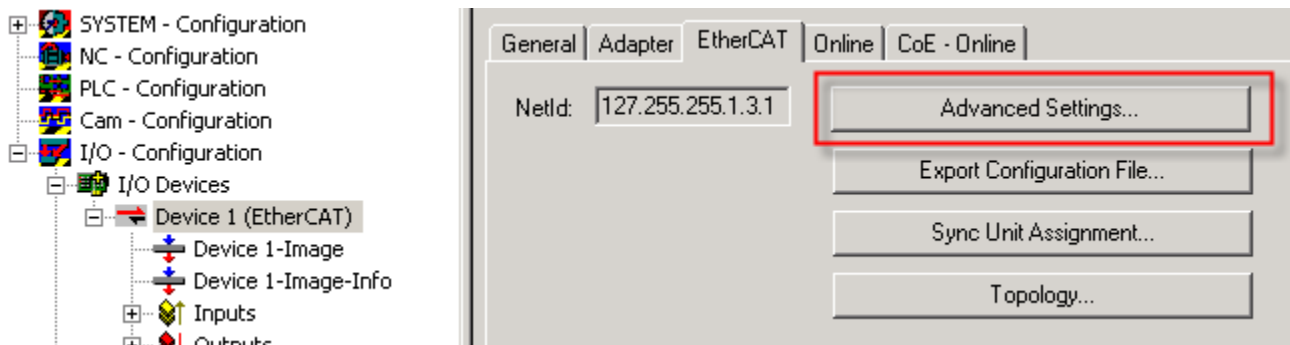

Fig. 10: EtherCAT Master, EtherCAT tab, Advanced Settings

5.3 Distributed Clocks and EPP1518

Digital inputs and Distributed Clocks

If the Distributed Clock of the EPP1518 is activated, the digital inputs are read in without the set filter promptly before the arrival of the querying EtherCAT datagram.

5.4 Configuration

5.4.1 Basic Function Principles

The EPP1518-0002 has 8 digital inputs. Of these, inputs 1, 2 and 3 as well as 5, 6 and 7 can each be used for one counter. The states of the individual inputs are always illustrated in the process image, irrespective of their use.

Input	M12 socket	Properties
1	X01, Pin 4	Digital input or counter input 1
2	X02, Pin 2	Digital input or Gate 1
3	X03, Pin 4	Digital input or Up/Down 1
4	X04, Pin 2	Digital input
5	X05, Pin 4	Digital input or counter input 2
6	X06, Pin 2	Digital input or Gate 2
7	X07, Pin 4	Digital input or Up/Down 2
8	X08, Pin 2	Digital input

Operation modes

Three operation modes [▶ 29] are available. The setting takes place by selecting the PDOs in the Sync-Manager:

Operation mode	Number of counter channels	Number of "free" digital inputs	Properties
2 up/down counters (32-bit)	2	2	Single pulses are counted at the counter inputs.
2 up/down counters (32-bit)	1	5	The gate input or the software gate enables the counter. The count direction is specified via CoE.
8 digital inputs, no counter	-	8	digital inputs: Filter for inputs 0 and 4 permanently set to 150 µs. The filter setting for the other inputs is configurable by software.

The GATE and Up/Down inputs can be converted to standard inputs.

Counting mode

The following settings for GATE and Up/Down can be combined and apply independently to each counter.

Counting mode with standard setting (up counter)

In the delivery state the Counter Value is incremented on each rising edge. The count direction is up.

The counter is disabled by applying a high level to the GATE input or by setting the *Inhibit Counters* bit.
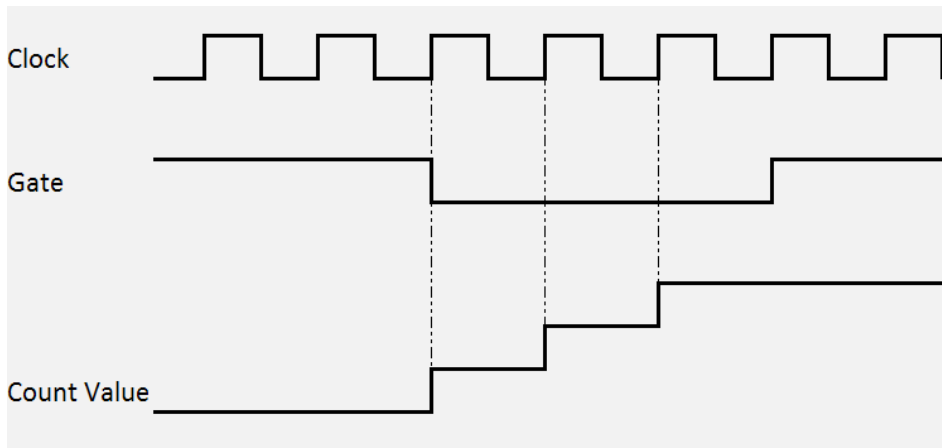
Fig. 11: Counting mode with standard setting

Counting mode with reversed count direction (down counter)

The count direction is changed by applying a high level to the Up/Down input or by setting the CoE object 0x80x0:04 *Count down.* The count direction is down.
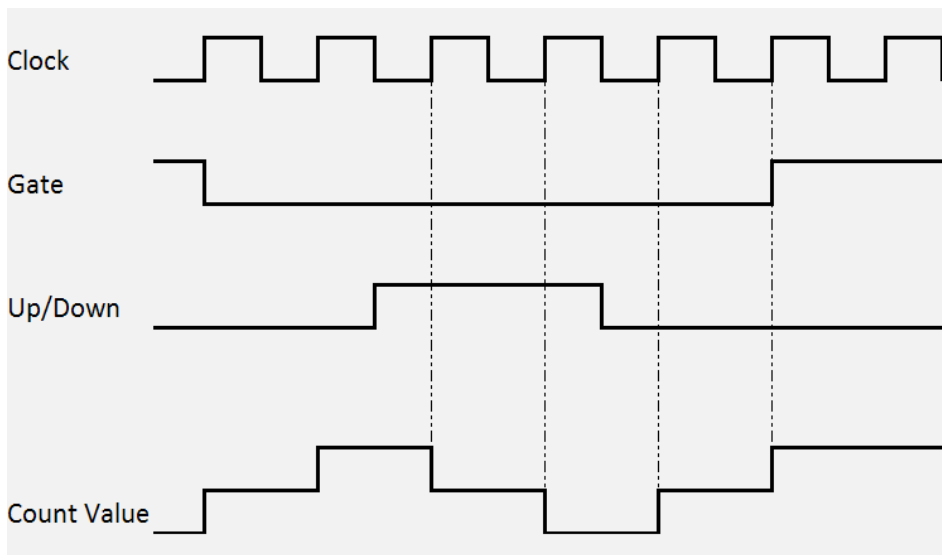

Fig. 12: Counting mode with reversed counting direction

Counting mode with inverted (negated) GATE input

In the default setting the counter is disabled by applying a high level to the GATE input or by setting the *Inhibit Counters* bit

Setting the CoE object 0x80x0:05 *Enable input gate* activates the counter if GATE is set and deactivates it if GATE is not set.
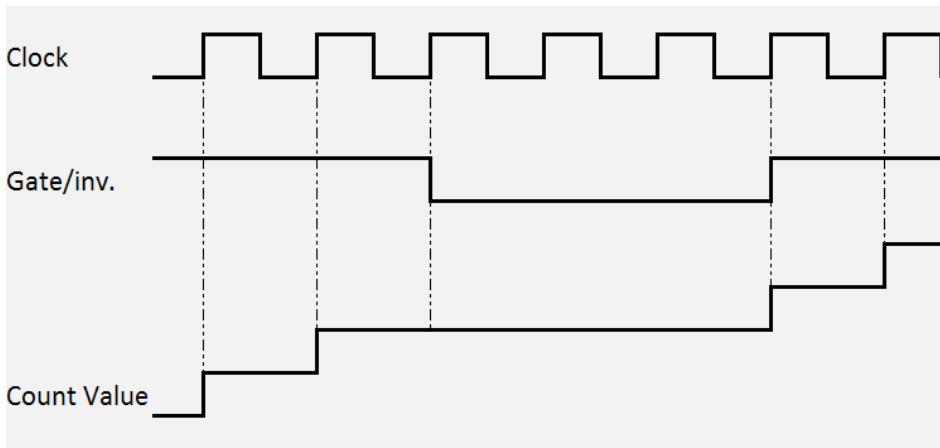
BECKHOFF

Fig. 13: Counting mode with inverted GATE input

Fig. 14: CoE for inverting the GATE input

5.4.2 Operation modes

Operation mode selection

There are three operation modes to choose from:

The setting takes place by selecting the PDOs in the Sync-Manager:

Operation mode	Number of 32-bit counters	Number of "free" digital inputs	Properties
2 up/down counters	2	2	Single pulses at the counter inputs are counted; the Gate input or the software gate enables the counter; count direction via CoE
1 up/down counters	1	5	
8 digital inputs, no counter	-	8	digital inputs: Filter for inputs 0 and 4 permanently set to 150 µs. The filter setting for the other inputs is configurable by software.

Operation mode settings of the PDOs	0x1600	0x1601	0x1A00	0x1A01	0x1A02	0x1A03	Comments
2 up/down counters (32-bit)	1	1	1	1	0/1	0/1	2 counters, digital inputs, diagnosis of Us
1 up/down counters (32-bit)	1	0	1	0	0/1	0/1	
8 digital inputs, no counter	0	0	0	0	0/1	0/1	digital inputs: Filter for inputs 0 and 4 permanently set to 150 µs. The filter setting for the other inputs is configurable by software.

The module parameters are set in the CoE objects 0x8000:0 for counter 1, 0x8010:0 for counter 2 and 0x8022:0 for the digital inputs. (integrate links)

● **The second counter is always active internally**

i Internally the second counter is always active, so that when switching from one 32-bit counter to two 32-bit counters the previous incoming pulses were counted in the second counter and saved in the Counter Value.

BECKHOFF

Two up/down counters

This is the operation mode in the factory setting.

The PDOs 0x1600 [▶ 43], 0x1601 [▶ 43] as well as 0x1A00 [▶ 43], 0x1A01 [▶ 44], 0x1A02 [▶ 44] and 0x1A03 [▶ 44] are activated. The meaning of the individual objects is explained in the object description.

One up/down counter

This mode can be set as follows:

The PDOs 0x1600 [▶ 43] as well as 0x1A00 [▶ 43], 0x1A02 [▶ 44] and 0x1A03 [▶ 44] are activated. The CoE objects are identical to the 2 x 32-bit counter operation mode.

BECKHOFF

8 digital inputs, no counter

This mode can be set as follows:

The PDOs 0x1A02 [▶ 44] and 0x1A03 [▶ 44] are activated. The meaning of the individual objects is explained in the object description.

5.4.3 Counter settings

Enabling the GATE and Up/Down inputs as standard inputs

By setting the CoE objects *Enable Input gate* and *Enable input UD*, the inputs are no longer allocated to the counters, but are used as standard inputs.

Index	Name	Flags	Value
⊟ 8000:0	CNT Settings	RW	> 19 <
8000:03	Enable reload	RW	TRUE
8000:04	Count down	RW	FALSE
8000:05	Operating mode	RW	Enable pos. gate (Gate sperrt mit ...
8000:07	Enable input gate	RW	FALSE
8000:08	Enable input UD	RW	FALSE
8000:13	Counter reload value	RW	0x0000C350 (50000)
⊞ 8010:0	CNT Settings	RW	> 19 <
⊞ 8022:0	DIG Filter Settings	RW	> 8 <

Fig. 15: Enabling the inputs

Setting the counter to a value specified by the process data

The counter (counter value) can be set to any desired value by the controller.

To do this, set the desired value in *Set counter value*. The value is then adopted by *Counter value* on a rising edge of the *Set counter* control bit.
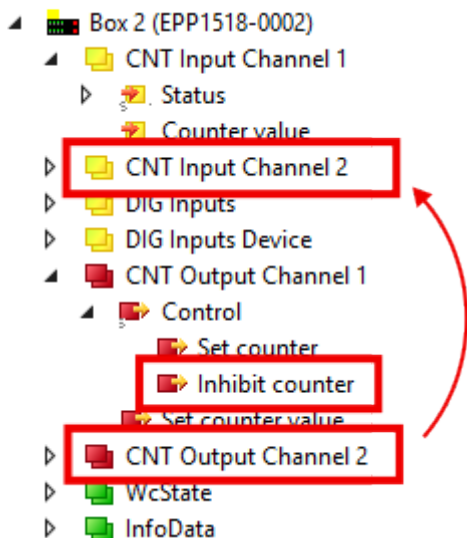
Fig. 16: Setting the counter

Automatic setting/resetting of the counter to a defined value

If a desired value is set in *Counter reload value* and the *Enable reload* bit is activated, the counter is set to 0 or to the set value if the specified value is exceeded or fallen below (depending on the counting direction).

BECKHOFF

Fig. 17: Automatic setting of the counter

Version: 1.1 EPP1518-0002

5.4.4 Restoring the delivery state

To restore the delivery state for backup objects in ELxxxx terminals / EPxxxx- and EPPxxxx boxes, the CoE object *Restore default parameters, SubIndex 001* can be selected in the TwinCAT System Manager (Config mode).
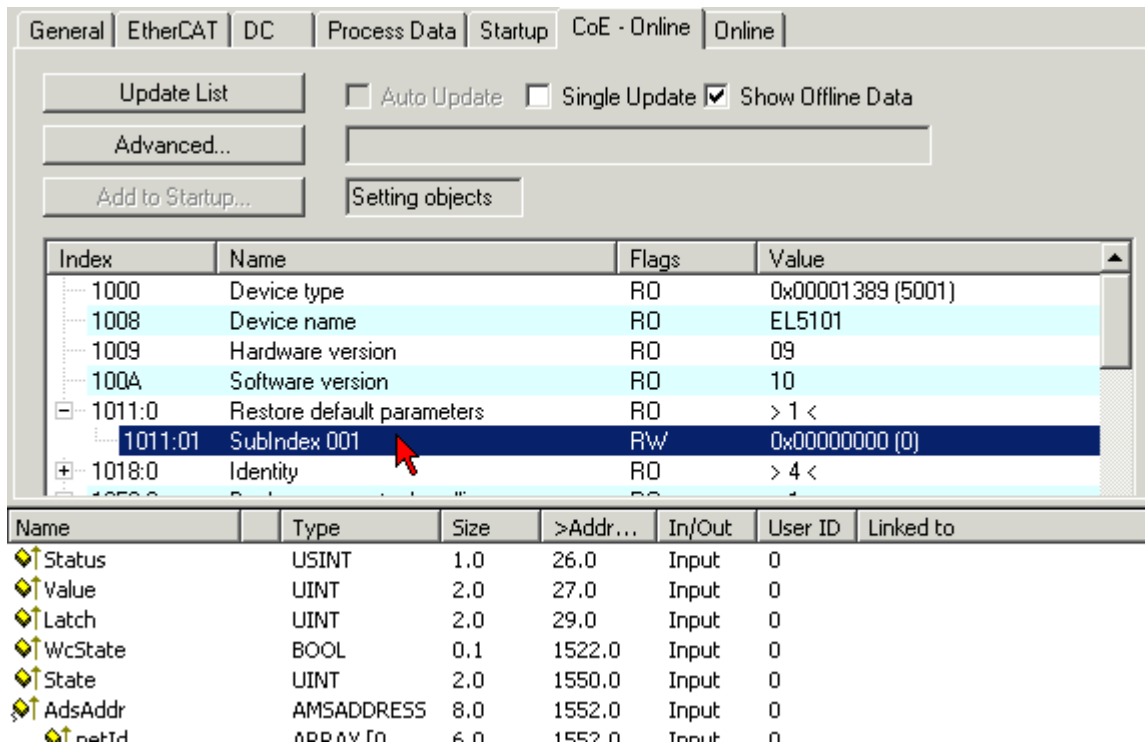
Fig. 18: Selecting the Restore default parameters PDO

Double-click on *SubIndex 001* to enter the Set Value dialog. Enter the value **1684107116** in field *Dec* or the value **0x64616F6C** in field *Hex* and confirm with OK.

All backup objects are reset to the delivery state.
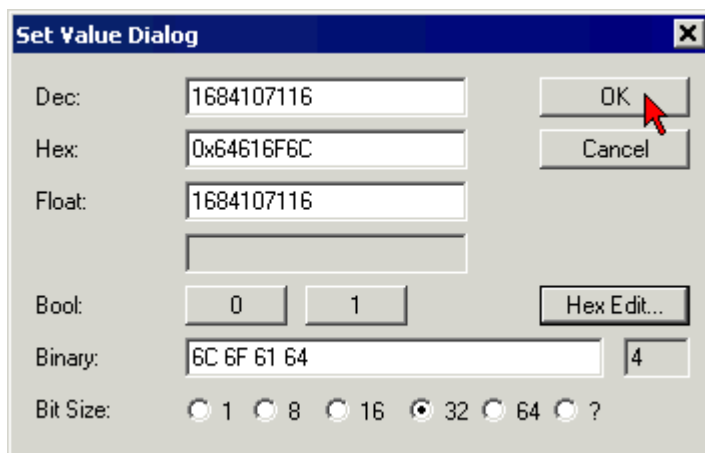
Fig. 19: Entering a restore value in the Set Value dialog

● **Alternative restore value**

ⅰ In some older terminals / boxes the backup objects can be switched with an alternative restore value:
Decimal value: 1819238756
Hexadecimal value: 0x6C6F6164

An incorrect entry for the restore value has no effect.

5.5   CoE objects

5.5.1   Object overview

ℹ️ EtherCAT XML Device Description

The display matches that of the CoE objects from the EtherCAT XML Device Description. We recommend downloading the latest XML file from the download area of the Beckhoff website and installing it according to installation instructions.

Index (hex)		Name	Flags	Default value
1000 [▶ 42]		Device type	RO	0x00001389 (5001$_{dec}$)
1008		Device name	RO	EPP1518-0002
1009 [▶ 42]		Hardware version	RO	00
100A [▶ 42]		Software version	RO	01.03
1011:0 [▶ 40]	**Subindex**	Restore default parameters	RO	0x01 (1$_{dec}$)
	1011:01	SubIndex 001	RW	0x00000000 (0$_{dec}$)
1018:0	**Subindex**	Identity	RO	0x04 (4$_{dec}$)
	1018:01	Vendor ID	RO	0x00000002 (2$_{dec}$)
	1018:02	Product code	RO	0x647624E8 (99500114$_{dec}$)
	1018:03	Revision	RO	0x00100002 (1685464296$_{dec}$)
	1018:04	Serial number	RO	0x00000000 (0$_{dec}$)
10F0:0 [▶ 42]	**Subindex**	Backup parameter handling	RO	0x01 (1$_{dec}$)
	10F0:01	Checksum	RO	0x00000000 (0$_{dec}$)
1600:0 [▶ 43]	**Subindex**	CNT RxPDO-Map Outputs Ch.1	RO	0x05 (5$_{dec}$)
	1600:01	SubIndex 001	RO	0x0000:00, 2
	1600:02	SubIndex 002	RO	0x7000:03, 1
	1600:03	SubIndex 003	RO	0x7000:04, 1
	1600:04	SubIndex 004	RO	0x0000:00, 12
	1600:05	SubIndex 005	RO	0x7000:11, 32
1601:0 [▶ 43]	**Subindex**	CNT RxPDO-Map Outputs Ch.2	RO	0x05 (5$_{dec}$)
	1601:01	SubIndex 001	RO	0x0000:00, 2
	1601:02	SubIndex 002	RO	0x7010:03, 1
	1601:03	SubIndex 003	RO	0x7010:04, 1
	1601:04	SubIndex 004	RO	0x0000:00, 12
	1601:05	SubIndex 005	RO	0x7010:11, 32
1A00:0 [▶ 43]	**Subindex**	CNT TxPDO-Map InputsCh.1	RO	0x0A (10$_{dec}$)
	1A00:01	SubIndex 001	RO	0x0000:00, 2
	1A00:02	SubIndex 002	RO	0x6000:03, 1
	1A00:03	SubIndex 003	RO	0x6000:04, 1
	1A00:04	SubIndex 004	RO	0x6000:05, 1
	1A00:05	SubIndex 005	RO	0x6000:06, 1
	1A00:06	SubIndex 006	RO	0x0000:00, 7
	1A00:07	SubIndex 007	RO	0x6000:0E, 1
	1A00:08	SubIndex 008	RO	0x6000:0F, 1
	1A00:09	SubIndex 009	RO	0x6000:10, 1
	1A00:0A	SubIndex 010	RO	0x6000:11, 32

Index (hex)		Name	Flags	Default value
1A01:0 [▶ 44]	**Subindex**	CNT TxPDO-Map Inputs Ch.2	RO	0x0A (10$_{dec}$)
	1A01:01	SubIndex 001	RO	0x0000:00, 2
	1A01:02	SubIndex 002	RO	0x6010:03, 1
	1A01:03	SubIndex 003	RO	0x6010:04, 1
	1A01:04	SubIndex 004	RO	0x6010:05, 1
	1A01:05	SubIndex 005	RO	0x6010:06, 1
	1A01:06	SubIndex 006	RO	0x0000:00, 7
	1A01:07	SubIndex 007	RO	0x6010:0E, 1
	1A01:08	SubIndex 008	RO	0x6010:0F, 1
	1A01:09	SubIndex 009	RO	0x6010:10, 1
	1A01:0A	SubIndex 010	RO	0x6010:11, 32
1A02:0 [▶ 44]	**Subindex**	DIG TxPDO-Map Inputs	RO	0x09 (9$_{dec}$)
	1A02:01	SubIndex 001	RO	0x6020:01, 1
	1A02:02	SubIndex 002	RO	0x6020:02, 1
	1A02:03	SubIndex 003	RO	0x6020:03, 1
	1A02:04	SubIndex 004	RO	0x6020:04, 1
	1A02:05	SubIndex 005	RO	0x6020:05, 1
	1A02:06	SubIndex 006	RO	0x6020:06, 1
	1A02:07	SubIndex 007	RO	0x6020:07, 1
	1A02:08	SubIndex 008	RO	0x6020:08, 1
	1A02:09	SubIndex 009	RO	0x0000:00, 8
1A03:0 [▶ 44]	**Subindex**	DIG TxPDO-Map Inputs Device	RO	0x07 (7$_{dec}$)
	1A03:01	SubIndex 001	RO	0x0000:00, 1
	1A03:02	SubIndex 002	RO	0xF600:02, 1
	1A03:03	SubIndex 003	RO	0xF600:03, 1
	1A03:04	SubIndex 004	RO	0x0000:00, 10
	1A03:05	SubIndex 005	RO	0xF600:0E, 1
	1A03:06	SubIndex 006	RO	0xF600:0F, 1
	1A03:07	SubIndex 007	RO	0xF600:10, 1
1C00:0 [▶ 45]	**Subindex**	Sync manager type	RO	0x04 (4$_{dec}$)
	1C00:01	SubIndex 001	RO	0x01 (1$_{dec}$)
	1C00:02	SubIndex 002	RO	0x02 (2$_{dec}$)
	1C00:03	SubIndex 003	RO	0x03 (3$_{dec}$)
	1C00:04	SubIndex 004	RO	0x04 (4$_{dec}$)
1C12:0 [▶ 45]	**Subindex**	RxPDO assign	RW	0x02 (2$_{dec}$)
	1C12:01	SubIndex 001	RW	0x1600 (5632$_{dec}$)
	1C12:02	SubIndex 002	RW	0x1601 (5633$_{dec}$)
1C13:0 [▶ 45]	**Subindex**	TxPDO assign	RW	0x04 (4$_{dec}$)
	1C13:01	SubIndex 001	RW	0x1A00 (6656$_{dec}$)
	1C13:02	SubIndex 002	RW	0x1A01 (6657$_{dec}$)
	1C13:03	SubIndex 003	RW	0x1A02 (6658$_{dec}$)
	1C13:04	SubIndex 004	RW	0x1A03 (6659$_{dec}$)

Index (hex)		Name	Flags	Default value
1C32:0 [▶ 46]	**Subindex**	SM output parameter	RO	0x20 (32$_{dec}$)
	1C32:01	Sync mode	RW	0x0001 (1$_{dec}$)
	1C32:02	Cycle time	RW	0x000F4240 (1000000$_{dec}$)
	1C32:03	Shift time	RO	0x00000000 (0$_{dec}$)
	1C32:04	Sync modes supported	RO	0xC007 (49159$_{dec}$)
	1C32:05	Minimum cycle time	RO	0x0003D090 (250000$_{dec}$)
	1C32:06	Calc and copy time	RO	0x00000000 (0$_{dec}$)
	1C32:07	Minimum delay time	RO	0x00000000 (0$_{dec}$)
	1C32:08	Command	RW	0x0000 (0$_{dec}$)
	1C32:09	Maximum delay time	RO	0x00000000 (0$_{dec}$)
	1C32:0B	SM event missed counter	RO	0x0000 (0$_{dec}$)
	1C32:0C	Cycle exceeded counter	RO	0x0000 (0$_{dec}$)
	1C32:0D	Shift too short counter	RO	0x0000 (0$_{dec}$)
	1C32:20	Sync error	RO	0x00 (0$_{dec}$)
1C33:0 [▶ 47]	**Subindex**	SM input parameter	RO	0x20 (32$_{dec}$)
	1C33:01	Sync mode	RW	0x0022 (34$_{dec}$)
	1C33:02	Cycle time	RW	0x000F4240 (1000000$_{dec}$)
	1C33:03	Shift time	RO	0x00000000 (0$_{dec}$)
	1C33:04	Sync modes supported	RO	0xC007 (49159$_{dec}$)
	1C33:05	Minimum cycle time	RO	0x0003D090 (250000$_{dec}$)
	1C33:06	Calc and copy time	RO	0x00000000 (0$_{dec}$)
	1C33:07	Minimum delay time	RO	0x00000000 (0$_{dec}$)
	1C33:08	Command	RW	0x0000 (0$_{dec}$)
	1C33:09	Maximum delay time	RO	0x00000000 (0$_{dec}$)
	1C33:0B	SM event missed counter	RO	0x0000 (0$_{dec}$)
	1C33:0C	Cycle exceeded counter	RO	0x0000 (0$_{dec}$)
	1C33:0D	Shift too short counter	RO	0x0000 (0$_{dec}$)
	1C33:20	Sync error	RO	0x00 (0$_{dec}$)
6000:0 [▶ 48]	**Subindex**	CNT Inputs	RO	0x11 (17$_{dec}$)
	6000:03	Set counter done	RO	0x00 (0$_{dec}$)
	6000:04	Counter inhibited	RO	0x00 (0$_{dec}$)
	6000:05	Status of input UD	RO	0x00 (0$_{dec}$)
	6000:06	Status of input clock	RO	0x00 (0$_{dec}$)
	6000:0E	Sync error	RO	0x00 (0$_{dec}$)
	6000:0F	TxPDO State	RO	0x00 (0$_{dec}$)
	6000:10	TxPDO Toggle	RO	0x00 (0$_{dec}$)
	6000:11	Counter value	RO	0x00000000 (0$_{dec}$)
6010:0 [▶ 48]	**Subindex**	CNT Inputs	RO	0x11 (17$_{dec}$)
	6010:03	Set counter done	RO	0x00 (0$_{dec}$)
	6010:04	Counter inhibited	RO	0x00 (0$_{dec}$)
	6010:05	Status of input UD	RO	0x00 (0$_{dec}$)
	6010:06	Status of input clock	RO	0x00 (0$_{dec}$)
	6010:0E	Sync error	RO	0x00 (0$_{dec}$)
	6010:0F	TxPDO State	RO	0x00 (0$_{dec}$)
	6010:10	TxPDO Toggle	RO	0x00 (0$_{dec}$)
	6010:11	Counter value	RO	0x00000000 (0$_{dec}$)

Index (hex)		Name	Flags	Default value
6020:0 [▶ 48]	**Subindex**	DIG Inputs	RO	0x08 (8_{dec})
	6020:01	Input 0	RO	0x00 (0_{dec})
	6020:02	Input 1	RO	0x00 (0_{dec})
	6020:03	Input 2	RO	0x00 (0_{dec})
	6020:04	Input 3	RO	0x00 (0_{dec})
	6020:05	Input 4	RO	0x00 (0_{dec})
	6020:06	Input 5	RO	0x00 (0_{dec})
	6020:07	Input 6	RO	0x00 (0_{dec})
	6020:08	Input 7	RO	0x00 (0_{dec})
7000:0 [▶ 48]	**Subindex**	CNT Outputs	RO	0x11 (17_{dec})
	7000:03	Set counter	RO	0x00 (0_{dec})
	7000:04	Inhibit counter	RO	0x00 (0_{dec})
	7000:11	Set counter value	RO	0x00000000 (0_{dec})
7010:0 [▶ 49]	**Subindex**	CNT Outputs	RO	0x11 (17_{dec})
	7010:03	Set counter	RO	0x00 (0_{dec})
	7010:04	Inhibit counter	RO	0x00 (0_{dec})
	7010:11	Set counter value	RO	0x00000000 (0_{dec})
8000:0 [▶ 41]	**Subindex**	CNT Settings	RW	0x13 (19_{dec})
	8000:03	Enable reload	RW	0x00 (0_{dec})
	8000:04	Count down	RW	0x00 (0_{dec})
	8000:05	Operating mode	RW	0x01 (1_{dec})
	8000:13	Counter reload value	RW	0x00000000 (0_{dec})
8010:0 [▶ 41]	**Subindex**	CNT Settings	RW	0x13 (19_{dec})
	8010:03	Enable reload	RW	0x00 (0_{dec})
	8010:04	Count down	RW	0x00 (0_{dec})
	8010:05	Operating mode	RW	0x01 (1_{dec})
	8010:13	Counter reload value	RW	0x00000000 (0_{dec})
8022:0 [▶ 41]	**Subindex**	DIG Filter Settings	RW	0x08 (8_{dec})
	8022:01	Input 0	RW	0x00 (0_{dec})
	8022:02	Input 1	RW	0x00 (0_{dec})
	8022:03	Input 2	RW	0x00 (0_{dec})
	8022:04	Input 3	RW	0x00 (0_{dec})
	8022:05	Input 4	RW	0x00 (0_{dec})
	8022:06	Input 5	RW	0x00 (0_{dec})
	8022:07	Input 6	RW	0x00 (0_{dec})
	8022:08	Input 7	RW	0x00 (0_{dec})
F000:0 [▶ 49]	**Subindex**	Modular device profile	RO	0x02 (2_{dec})
	F000:01	Module index distance	RO	0x0010 (16_{dec})
	F000:02	Maximum number of modules	RO	0x0003 (3_{dec})
F008 [▶ 49]		Code word	RW	0x00000000 (0_{dec})
F010:0 [▶ 49]	**Subindex**	Module list	RW	0x03 (3_{dec})
	F010:01	SubIndex 001	RW	0x00000096 (150_{dec})
	F010:02	SubIndex 002	RW	0x00000096 (150_{dec})
	F010:03	SubIndex 003	RW	0x00000118 (280_{dec})

Index (hex)		Name	Flags	Default value
F600:0 [▶ 49]	**Subindex**	DIG Inputs	RO	0x10 (16$_{dec}$)
	F600:02	Error channel 1	RO	0x00 (0$_{dec}$)
	F600:03	Error channel 2	RO	0x00 (0$_{dec}$)
	F600:0E	Sync error	RO	0x00 (0$_{dec}$)
	F600:0F	TxPDO State	RO	0x00 (0$_{dec}$)
	F600:10	TxPDO Toggle	RO	0x00 (0$_{dec}$)

Key

Flags:
RO (Read Only): this object can be read only
RW (Read/Write): this object can be read and written to

5.5.2 Object description and parameterization

ℹ **Parameterization**

The terminal is parameterized via the CoE - Online tab (double-click on the respective object) or via the Process Data tab (assignment of PDOs).

ℹ **EtherCAT XML Device Description**

The display matches that of the CoE objects from the EtherCAT XML Device Description. We recommend downloading the latest XML file from the download area on the Beckhoff website (http://www.beckhoff.de/german/default.htm?download/elconfg.htm) and installing it according to the installation instructions.

Introduction

The CoE overview contains objects for different intended applications:

- Objects required for parameterization [▶ 40] during commissioning
- Objects intended for regular operation, e.g. through ADS access.
- Objects for indicating internal settings (may be fixed)
- Further profile-specific objects [▶ 48] indicating inputs, outputs and status information

The following section first describes the objects required for normal operation, followed by a complete overview of missing objects.

Additional objects

5.5.2.1 Objects to be parameterized during commissioning

Index 1011 Restore default parameters

Index (hex)	Name	Meaning	Data type	Flags	Default
1011:0	Restore default parameters	Restore default parameters	UINT8	RO	0x01 (1$_{dec}$)
1011:01	SubIndex 001	If this object is set to "**0x64616F6C**" in the set value dialog, all backup objects are reset to their delivery state.	UINT32	RW	0x00000000 (0$_{dec}$)

Index 8000 CNT Settings

Index (hex)	Name	Meaning		Data type	Flags	Default
8000:0	CNT Settings	Maximum subindex		UINT8	RO	0x13 (19$_{dec}$)
8000:03	Enable reload	The counter counts to the value in index 0x8000:13 [▶ 41]		BOOLEAN	RW	0x00 (0$_{dec}$)
8000:04	Count down	Counting direction:		BOOLEAN	RW	0x00 (0$_{dec}$)
		0$_{bin}$	Forward			
		1$_{bin}$	Down			
8000:05	Operating mode	Operation mode		BIT2	RW	0x01 (1$_{dec}$)
		01$_{bin}$	Enable pos. gate (gate inhibits with positive level)			
		10$_{bin}$	Enable neg. gate (gate inhibits with negative level)			
8000:13	Counter reload value	The limit that can be activated via "Enable reload" (index 0x8000:03 [▶ 41]). If counting upward, the counter counts up to this limit and, on exceeding it, starts again from zero. If counting downward, the counter counts down to 0 and, on falling below 0, is reloaded with the value from this register.		UINT32	RW	0x00000000 (0$_{dec}$)

Index 8010 CNT Settings

Index (hex)	Name	Meaning		Data type	Flags	Default
8010:0	CNT Settings	Maximum subindex		UINT8	RO	0x13 (19$_{dec}$)
8010:03	Enable reload	The counter counts to the value in index 0x8010:13 [▶ 41]		BOOLEAN	RW	0x00 (0$_{dec}$)
8010:04	Count down	Counting direction:		BOOLEAN	RW	0x00 (0$_{dec}$)
		0$_{bin}$	Forward			
		1$_{bin}$	Down			
8010:05	Operating mode	Operation mode		BIT2	RW	0x01 (1$_{dec}$)
		01$_{bin}$	Enable pos. gate (gate inhibits with positive level)			
		10$_{bin}$	Enable neg. gate (gate inhibits with negative level)			
8010:13	Counter reload value	The limit that can be activated via "Enable reload" (index 0x8010:03 [▶ 41]). If counting upward, the counter counts up to this limit and, on exceeding it, starts again from zero. If counting downward, the counter counts down to 0 and, on falling below 0, is reloaded with the value from this register.		UINT32	RW	0x00000000 (0$_{dec}$)

Index 8022 DIG Filter Settings

Index (hex)	Name	Meaning		Data type	Flags	Default
8022:0	DIG Filter Settings	Maximum subindex		UINT8	RO	0x08 (8$_{dec}$)
8022:01	Input 0	Filter time for the input		UINT8	RW	0x00 (0$_{dec}$)
		0$_{dec}$	10 µs			
		1$_{dec}$	200 µs			
		2$_{dec}$	1 ms			
		3$_{dec}$	3 ms			
		4$_{dec}$	10 ms			
		5$_{dec}$	100 ms			
8022:02	Input 1	see 0x8022:01 [▶ 41]		UINT8	RW	0x00 (0$_{dec}$)
8022:03	Input 2	see 0x8022:01 [▶ 41]		UINT8	RW	0x00 (0$_{dec}$)
8022:04	Input 3	see 0x8022:01 [▶ 41]		UINT8	RW	0x00 (0$_{dec}$)
8022:05	Input 4	see 0x8022:01 [▶ 41]		UINT8	RW	0x00 (0$_{dec}$)
8022:06	Input 5	see 0x8022:01 [▶ 41]		UINT8	RW	0x00 (0$_{dec}$)
8022:07	Input 6	see 0x8022:01 [▶ 41]		UINT8	RW	0x00 (0$_{dec}$)
8022:08	Input 7	see 0x8022:01 [▶ 41]		UINT8	RW	0x00 (0$_{dec}$)

5.5.2.2 Standard objects (0x1000-0x1FFF)

The standard objects have the same meaning for all EtherCAT slaves.

Index 1000 Device type

Index (hex)	Name	Meaning	Data type	Flags	Default
1000:0	Device type	Device type of the EtherCAT slave: The Lo-Word contains the CoE profile used (5001). The Hi-Word contains the module profile according to the modular device profile.	UINT32	RO	0x00001389 (5001_{dec})

Index 1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EPP1518-0002

Index 1009 Hardware version

Index (hex)	Name	Meaning	Data type	Flags	Default
1009:0	Hardware version	Hardware version of the EtherCAT slave	STRING	RO	00

Index 100A Software Version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	01.03

Index 1018 Identity

Index (hex)	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4_{dec})
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00000002 (2_{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x647624E8 (1685464296_{dec})
1018:03	Revision	Revision number of the EtherCAT slave; the Low Word (bit 0-15) indicates the special terminal number, the High Word (bit 16-31) refers to the device description	UINT32	RO	0x00100002 (1048578_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave; the Low Byte (bit 0-7) of the Low Word contains the year of production, the High Byte (bit 8-15) of the Low Word contains the week of production, the High Word (bit 16-31) is 0	UINT32	RO	0x00000000 (0_{dec})

Index 10F0 Backup parameter handling

Index (hex)	Name	Meaning	Data type	Flags	Default
10F0:0	Backup parameter handling	Information for standardized loading and saving of backup entries	UINT8	RO	0x01 (1_{dec})
10F0:01	Checksum	Checksum across all backup entries of the EtherCAT slave	UINT32	RO	0x00000000 (0_{dec})

Index 1600 CNT RxPDO-Map Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	CNT RxPDO-Map Outputs Ch.1	PDO Mapping RxPDO 1	UINT8	RO	0x05 (5$_{dec}$)
1600:01	SubIndex 001	1. PDO Mapping entry (object 0x7040 (DO Outputs), entry 0x01 (Output 0))	UINT32	RO	0x0000:00, 2
1600:02	SubIndex 002	2. PDO Mapping entry (15 bits align)	UINT32	RO	0x7000:03, 1
1600:03	SubIndex 003	3. PDO Mapping entry (object 0x7010 (CNT Outputs), entry 0x03 (Set counter))	UINT32	RO	0x7000:04, 1
1600:04	SubIndex 004	4. PDO Mapping entry (object 0x7010 (CNT Outputs), entry 0x04 (Inhibit counter))	UINT32	RO	0x0000:00, 12
1600:05	SubIndex 005	5. PDO Mapping entry (12 bits align)	UINT32	RO	0x7000:11, 32

Index 1601 CNT RxPDO-Map OutputsCh.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	CNT RxPDO-Map Outputs Ch.2	PDO Mapping RxPDO 2	UINT8	RO	0x05 (5$_{dec}$)
1601:01	SubIndex 001	1. PDO Mapping entry (object 0x7020 (CNT Outputs), entry 0x01 (Enable output functions))	UINT32	RO	0x0000:00, 2
1601:02	SubIndex 002	2. PDO Mapping entry (object 0x7020 (CNT Outputs), entry 0x02 (Set output))	UINT32	RO	0x7010:03, 1
1601:03	SubIndex 003	3. PDO Mapping entry (object 0x7020 (CNT Outputs), entry 0x03 (Set counter))	UINT32	RO	0x7010:04, 1
1601:04	SubIndex 004	4. PDO Mapping entry (object 0x7020 (CNT Outputs), entry 0x04 (Inhibit counter))	UINT32	RO	0x0000:00, 12
1601:05	SubIndex 005	5. PDO Mapping entry (12 bits align)	UINT32	RO	0x7010:11, 32

Index 1A00 CNT TxPDO-Map InputsCh.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	CNT TxPDO-Map InputsCh.1	PDO Mapping TxPDO 1	UINT8	RO	0x0A (10$_{dec}$)
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (DI Inputs Ch.1), entry 0x01 (Input 0))	UINT32	RO	0x0000:00, 2
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (DI Inputs Ch.1), entry 0x02 (Input 1))	UINT32	RO	0x6000:03, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (DI Inputs Ch.1), entry 0x03 (Input 2))	UINT32	RO	0x6000:04, 1
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (DI Inputs Ch.1), entry 0x04 (Input 3))	UINT32	RO	0x6000:05, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (DI Inputs Ch.1), entry 0x05 (Input 4))	UINT32	RO	0x6000:06, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (object 0x6000 (DI Inputs Ch.1), entry 0x06 (Input 5))	UINT32	RO	0x0000:00, 7
1A00:07	SubIndex 007	7. PDO Mapping entry (object 0x6000 (DI Inputs Ch.1), entry 0x06 (Input 6))	UINT32	RO	0x6000:0E, 1
1A00:08	SubIndex 008	8. PDO Mapping entry (object 0x6000 (DI Inputs Ch.1), entry 0x08 (Input 7))	UINT32	RO	0x6000:0F, 1
1A00:09	SubIndex 009	9. PDO Mapping entry (8 bits align)	UINT32	RO	0x6000:10, 1
1A00:0A	SubIndex 010	10. PDO Mapping entry (object 0x6000 (CNT Inputs), entry 0x11 (Counter value))	UINT32	RO	0x6000:11, 32

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Index 1A01 CNT TxPDO-Map InputsCh.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	CNT TxPDO-Map Inputs Ch.2	PDO Mapping TxPDO 2	UINT8	RO	0x0A (10$_{dec}$)
1A01:01	SubIndex 001	1. PDO Mapping entry (15 bits align)	UINT32	RO	0x0000:00, 2
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6020 (CNT Inputs), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6010:03, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (CNT Inputs), entry 0x11 (Counter value))	UINT32	RO	0x6010:04, 1
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6020 (CNT Inputs), entry 0x04 (Counter inhibited))	UINT32	RO	0x6010:05, 1
1A01:05	SubIndex 005	5. PDO Mapping entry (object 0x6020 (CNT Inputs), entry 0x05 (Status of input UD))	UINT32	RO	0x6010:06, 1
1A01:06	SubIndex 006	6. PDO Mapping entry (object 0x6020 (CNT Inputs), entry 0x06 (Status of input clock))	UINT32	RO	0x0000:00, 7
1A01:07	SubIndex 007	7. PDO Mapping entry (8 bits align)	UINT32	RO	0x6010:0E, 1
1A01:08	SubIndex 008	8. PDO Mapping entry (object 0x6020 (CNT Inputs), entry 0x0F (TxPDO State))	UINT32	RO	0x6010:0F, 1
1A01:09	SubIndex 009	9. PDO Mapping entry (object 0x6020 (CNT Inputs), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6010:10, 1
1A01:0A	SubIndex 010	10. PDO Mapping entry (object 0x6010 (CNT Inputs), entry 0x11 (Counter value))	UINT32	RO	0x6010:11, 32

Index 1A02 DIG TxPDO-Map Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	DIG TxPDO-Map Inputs	PDO Mapping TxPDO 3	UINT8	RO	0x09 (9$_{dec}$)
1A02:01	SubIndex 001	1. PDO Mapping entry (2 bits align)	UINT32	RO	0x6020:01, 1
1A02:02	SubIndex 002	2. PDO Mapping entry (object 0x6030 (ENC Inputs), entry 0x03 (Set counter done))	UINT32	RO	0x6020:02, 1
1A02:03	SubIndex 003	3. PDO Mapping entry (object 0x6030 (ENC Inputs), entry 0x04 (Counter underflow))	UINT32	RO	0x6020:03, 1
1A02:04	SubIndex 004	4. PDO Mapping entry (object 0x6030 (ENC Inputs), entry 0x05 (Counter overflow))	UINT32	RO	0x6020:04, 1
1A02:05	SubIndex 005	5. PDO Mapping entry (3 bits align)	UINT32	RO	0x6020:05, 1
1A02:06	SubIndex 006	6. PDO Mapping entry (object 0x6030 (ENC Inputs), entry 0x09 (Status of input A))	UINT32	RO	0x6020:06, 1
1A02:07	SubIndex 007	7. PDO Mapping entry (object 0x6030 (ENC Inputs), entry 0x0A (Status of input B))	UINT32	RO	0x6020:07, 1
1A02:08	SubIndex 008	8. PDO Mapping entry (object 0x6030 (ENC Inputs), entry 0x0B (Status of input C))	UINT32	RO	0x6020:08, 1
1A02:09	SubIndex 009	9. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 8

Index 1A03 DIG TxPDO-Map Inputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	DIG TxPDO-Map Inputs Device	PDO Mapping TxPDO 4	UINT8	RO	0x07 (7$_{dec}$)
1A03:01	SubIndex 001	1. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A03:02	SubIndex 002	2. PDO Mapping entry (object 0xF600 (DIG Inputs), entry 0x02 (Error channel 1))	UINT32	RO	0xF600:02, 1
1A03:03	SubIndex 003	3. PDO Mapping entry (object 0xF600 (DIG Inputs), entry 0x03 (Error channel 2))	UINT32	RO	0xF600:03, 1
1A03:04	SubIndex 004	4. PDO Mapping entry (10 bits align)	UINT32	RO	0x0000:00, 10
1A03:05	SubIndex 005	5. PDO Mapping entry (object 0xF600 (DIG Inputs), entry 0x0E (Sync error))	UINT32	RO	0xF600:0E, 1
1A03:06	SubIndex 006	6. PDO Mapping entry (1 bits align)	UINT32	RO	0xF600:0F, 1
1A03:07	SubIndex 007	7. PDO Mapping entry (object 0xF600 (DIG Inputs), entry 0x10 (TxPDO Toggle))	UINT32	RO	0xF600:10, 1

Index 1C00 Sync manager type

Index (hex)	Name	Meaning	Data type	Flags	Default
1C00:0	Sync manager type	Using the sync managers	UINT8	RO	0x04 (4_{dec})
1C00:01	SubIndex 001	Sync-Manager Type Channel 1: Mailbox Write	UINT8	RO	0x01 (1_{dec})
1C00:02	SubIndex 002	Sync-Manager Type Channel 2: Mailbox Read	UINT8	RO	0x02 (2_{dec})
1C00:03	SubIndex 003	Sync-Manager Type Channel 3: Process Data Write (Outputs)	UINT8	RO	0x03 (3_{dec})
1C00:04	SubIndex 004	Sync-Manager Type Channel 4: Process Data Read (Inputs)	UINT8	RO	0x04 (4_{dec})

Index 1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x02 (2_{dec})
1C12:01	Subindex 001	1. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1600 (5632_{dec})
1C12:02	Subindex 002	2. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1601 (5633_{dec})

Index 1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x04 (4_{dec})
1C13:01	Subindex 001	1. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	Subindex 002	2. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A01 (6657_{dec})
1C13:03	Subindex 003	3. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A02 (6658_{dec})
1C13:04	Subindex 004	4. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A03 (6659_{dec})

Index 1C32 SM output parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C32:0	SM output parameter	Synchronization parameters for the outputs	UINT8	RO	0x20 (32$_{dec}$)
1C32:01	Sync mode	• 0: Free Run • 1: Synchronous with SM 2 event • 2: DC-Mode - Synchronous with SYNC0 Event • 3: DC-Mode - Synchronous with SYNC1 event	UINT16	RW	0x0001 (1$_{dec}$)
1C32:02	Cycle time	Cycle time (in ns): • Synchronous with SM 2 event: Master cycle time • DC mode: SYNC0/SYNC1 Cycle Time	UINT32	RW	0x000F4240 (1000000$_{dec}$)
1C32:03	Shift time	Time between SYNC0 event and output of the outputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0$_{dec}$)
1C32:04	Sync modes supported	Supported synchronization modes: • Bit 0 = 1: free run is supported • Bit 1 = 1: synchronous with SM 2 event is supported • Bit 2-3 = 01: DC mode is supported • Bit 4-5 = 10: Output shift with SYNC1 event (only DC mode) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08 [▶ 46])	UINT16	RO	0xC007 (49159$_{dec}$)
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x0003D090 (250000$_{dec}$)
1C32:06	Calc and copy time	Minimum time between SYNC0 and SYNC1 event (in ns, DC mode only)	UINT32	RO	0x00000000 (0$_{dec}$)
1C32:07	Minimum delay time	Minimum time between SYNC1 event and output of the outputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0$_{dec}$)
1C32:08	Command	• 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 0x1C32:03 [▶ 46], 0x1C32:05 [▶ 46], 0x1C32:06 [▶ 46], 0x1C32:07 [▶ 46], 0x1C32:09 [▶ 46], 0x1C33:03 [▶ 47], 0x1C33:06 [▶ 46], 0x1C33:07 [▶ 46] and 0x1C33:09 [▶ 47] are updated with the maximum measured values. For a subsequent measurement the measured values are reset	UINT16	RW	0x0000 (0$_{dec}$)
1C32:09	Maximum delay time	Minimum time between SYNC1 event and output of the outputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0$_{dec}$)
1C32:0B	SM event missed counter	Number of missed SM events in OPERATIONAL (DC mode only)	UINT16	RO	0x0000 (0$_{dec}$)
1C32:0C	Cycle exceeded counter	Number of occasions the cycle time was exceeded in OPERATIONAL (cycle was not completed in time or the next cycle began too early)	UINT16	RO	0x0000 (0$_{dec}$)
1C32:0D	Shift too short counter	Number of occasions that the interval between SYNC0 and SYNC1 event was too short (DC mode only)	UINT16	RO	0x0000 (0$_{dec}$)
1C32:20	Sync error	The synchronization was not correct in the last cycle (outputs were output too late; DC mode only)	BOOLEAN	RO	0x00 (0$_{dec}$)

Index 1C33 SM input parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	Current synchronization mode: • 0: Free Run • 1: Synchronous with SM 3 Event (no outputs available) • 2: DC - Synchronous with SYNC0 Event • 3: DC - Synchronous with SYNC1 Event • 34: Synchronous with SM 2 event (outputs available)	UINT16	RW	0x0022 (34_{dec})
1C33:02	Cycle time	as 0x1C32:02 [▶ 46]	UINT32	RW	0x000F4240 (1000000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:04	Sync modes supported	Supported synchronization modes: • Bit 0: free run is supported • Bit 1: Synchronous with SM 2 Event is supported (outputs available) • Bit 1: Synchronous with SM 3 Event is supported (no outputs available) • Bit 2-3 = 01: DC mode is supported • Bit 4-5 = 01: Input shift through local event (outputs available) • Bit 4-5 = 10: Input shift with SYNC1 event (no outputs available) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08 [▶ 46] or 0x1C33:08 [▶ 47])	UINT16	RO	0xC007 (49159_{dec})
1C33:05	Minimum cycle time	as 0x1C32:05 [▶ 46]	UINT32	RO	0x0003D090 (250000_{dec})
1C33:06	Calc and copy time	Time between reading of the inputs and availability of the inputs for the master (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:07	Minimum delay time	as 0x1C32:07 [▶ 46]	UINT32	RO	0x00000000 (0_{dec})
1C33:08	Command	as 0x1C32:08 [▶ 46]	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum delay time	as 0x1C32:09 [▶ 46]	UINT32	RO	0x00000000 (0_{dec})
1C33:0B	SM event missed counter	as 0x1C32:11	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 0x1C32:12	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 0x1C32:13	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 0x1C32:32	BOOLEAN	RO	0x00 (0_{dec})

5.5.2.3   Profile-specific objects (0x6000-0xFFFF)

The profile-specific objects have the same meaning for all EtherCAT slaves that support the profile 5001.

Index 6000 CNT Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	CNT Inputs	Maximum subindex	UINT8	RO	0x11 (17$_{dec}$)
6000:03	Set counter done	The counter was set	BOOLEAN	RO	0x00 (0$_{dec}$)
6000:04	Counter inhibited	The counter is stopped for as long as this bit is set	BOOLEAN	RO	0x00 (0$_{dec}$)
6000:05	Status of input UD	The state of the up/down input	BOOLEAN	RO	0x00 (0$_{dec}$)
6000:06	Status of input clock	The state of the clock input	BOOLEAN	RO	0x00 (0$_{dec}$)
6000:0E	Sync error	Synchronization error	BOOLEAN	RO	0x00 (0$_{dec}$)
6000:0F	TxPDO State	Validity of the data of the associated TxPDO (0 = valid, 1 = invalid)	BOOLEAN	RO	0x00 (0$_{dec}$)
6000:10	TxPDO Toggle	The TxPDO toggle is toggled by the slave when the data of the associated TxPDO is updated	BOOLEAN	RO	0x00 (0$_{dec}$)
6000:11	Counter value	Counter value	UINT32	RO	0x00000000 (0$_{dec}$)

Index 6010 CNT Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6010:0	CNT Inputs	Maximum subindex	UINT8	RO	0x11 (17$_{dec}$)
6010:03	Set counter done	The counter was set	BOOLEAN	RO	0x00 (0$_{dec}$)
6010:04	Counter inhibited	The counter is stopped for as long as this bit is set	BOOLEAN	RO	0x00 (0$_{dec}$)
6010:05	Status of input UD	The state of the up/down input	BOOLEAN	RO	0x00 (0$_{dec}$)
6010:06	Status of input clock	The state of the clock input	BOOLEAN	RO	0x00 (0$_{dec}$)
6010:0E	Sync error	Synchronization error	BOOLEAN	RO	0x00 (0$_{dec}$)
6010:0F	TxPDO State	Validity of the data of the associated TxPDO (0 = valid, 1 = invalid)	BOOLEAN	RO	0x00 (0$_{dec}$)
6010:10	TxPDO Toggle	The TxPDO toggle is toggled by the slave when the data of the associated TxPDO is updated	BOOLEAN	RO	0x00 (0$_{dec}$)
6010:11	Counter value	Counter value	UINT32	RO	0x00000000 (0$_{dec}$)

Index 6020 DIG Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6020:0	DIG Inputs	Maximum subindex	UINT8	RO	0x08 (8$_{dec}$)
6020:01	Input 0	Digital input 0	BOOLEAN	RO	0x00 (0$_{dec}$)
6020:02	Input 1	Digital input 1	BOOLEAN	RO	0x00 (0$_{dec}$)
6020:03	Input 2	Digital input 2	BOOLEAN	RO	0x00 (0$_{dec}$)
6020:04	Input 3	Digital input 3	BOOLEAN	RO	0x00 (0$_{dec}$)
6020:05	Input 4	Digital input 4	BOOLEAN	RO	0x00 (0$_{dec}$)
6020:06	Input 5	Digital input 5	BOOLEAN	RO	0x00 (0$_{dec}$)
6020:07	Input 6	Digital input 6	BOOLEAN	RO	0x00 (0$_{dec}$)
6020:08	Input 7	Digital input 7	BOOLEAN	RO	0x00 (0$_{dec}$)

Index 7000 CNT Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7000:0	CNT Outputs	Maximum subindex	UINT8	RO	0x11 (17$_{dec}$)
7000:03	Set counter	Set counter value	BOOLEAN	RO	0x00 (0$_{dec}$)
7000:04	Inhibit counter	The counter is stopped, as long as this bit is active. The previous counter state is retained.	BOOLEAN	RO	0x00 (0$_{dec}$)
7000:11	Set counter value	This is the counter value to be set via "Set counter" (index 0x7000:03 [▶ 48]).	UINT32	RO	0x00000000 (0$_{dec}$)

Index 7010 CNT Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7010:0	CNT Outputs	Maximum subindex	UINT8	RO	0x11 (17$_{dec}$)
7010:03	Set counter	Set counter value	BOOLEAN	RO	0x00 (0$_{dec}$)
7010:04	Inhibit counter	The counter is stopped, as long as this bit is active. The previous counter state is retained.	BOOLEAN	RO	0x00 (0$_{dec}$)
7010:11	Set counter value	This is the counter value to be set via "Set counter" (index 0x7000:03 [▶ 49]).	UINT32	RO	0x00000000 (0$_{dec}$)

Index F000 Modular Device Profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular device profile	General information for the modular device profile	UINT8	RO	0x02 (2$_{dec}$)
F000:01	Module index distance	Index distance of the objects of the individual channels	UINT16	RO	0x0010 (16$_{dec}$)
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0003 (3$_{dec}$)

Index F008 Code word

Index (hex)	Name	Meaning	Data type	Flags	Default
F008:0	Code word	reserved	UINT32	RW	0x00000000 (0$_{dec}$)

Index F010 Module List

Index (hex)	Name	Meaning	Data type	Flags	Default
F010:0	Module list	Maximum subindex	UINT8	RW	0x03 (3$_{dec}$)
F010:01	SubIndex 001	reserved	UINT32	RW	0x00000096 (150$_{dec}$)
F010:02	SubIndex 002	reserved	UINT32	RW	0x00000096 (150$_{dec}$)
F010:03	SubIndex 003	reserved	UINT32	RW	0x00000118 (280$_{dec}$)

Index F600 DIG Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
F600:0	DIG Inputs	Maximum subindex	UINT8	RO	0x10 (16$_{dec}$)
F600:02	Error channel 1	If this bit is set, a short circuit has been detected in the supply voltage to sensor group 1 (inputs 0 - 3).	BOOLEAN	RO	0x00 (0$_{dec}$)
F600:03	Error channel 2	If this bit is set, a short circuit has been detected in the supply voltage to sensor group 2 (inputs 4 - 7).	BOOLEAN	RO	0x00 (0$_{dec}$)
F600:0E	Sync error	Synchronization error	BOOLEAN	RO	0x00 (0$_{dec}$)
F600:0F	TxPDO State	Validity of the data of the associated TxPDO (0 = valid, 1 = invalid)	BOOLEAN	RO	0x00 (0$_{dec}$)
F600:10	TxPDO Toggle	The TxPDO toggle is toggled by the slave when the data of the associated TxPDO is updated	BOOLEAN	RO	0x00 (0$_{dec}$)

6   Appendix

6.1   General operating conditions

Protection degrees (IP-Code)

The standard IEC 60529 (DIN EN 60529) defines the degrees of protection in different classes.

1. Number: dust protection and touch guard	Definition
0	Non-protected
1	Protected against access to hazardous parts with the back of a hand. Protected against solid foreign objects of Ø 50 mm
2	Protected against access to hazardous parts with a finger. Protected against solid foreign objects of Ø 12.5 mm.
3	Protected against access to hazardous parts with a tool. Protected against solid foreign objects Ø 2.5 mm.
4	Protected against access to hazardous parts with a wire. Protected against solid foreign objects Ø 1 mm.
5	Protected against access to hazardous parts with a wire. Dust-protected. Intrusion of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the device or to impair safety.
6	Protected against access to hazardous parts with a wire. Dust-tight. No intrusion of dust.

2. Number: water* protection	Definition
0	Non-protected
1	Protected against water drops
2	Protected against water drops when enclosure tilted up to 15°.
3	Protected against spraying water. Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects.
4	Protected against splashing water. Water splashed against the disclosure from any direction shall have no harmful effects
5	Protected against water jets
6	Protected against powerful water jets
7	Protected against the effects of temporary immersion in water. Intrusion of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water for 30 min. in 1 m depth.

*) These protection classes define only protection against water!

Chemical Resistance

The Resistance relates to the Housing of the IP 67 modules and the used metal parts. In the table below you will find some typical resistance.

Character	Resistance
Steam	at temperatures >100°C: not resistant
Sodium base liquor (ph-Value > 12)	at room temperature: resistant > 40°C: not resistant
Acetic acid	not resistant
Argon (technical clean)	resistant

Key

- resistant: Lifetime several months
- non inherently resistant: Lifetime several weeks
- not resistant: Lifetime several hours resp. early decomposition

6.2   Accessories

Mounting

Ordering information	Description
ZS5300-0011	Mounting rail

Cables

A complete overview of pre-assembled cables for fieldbus components can be found here.

Ordering information	Description	Link
ZK2000-6xxx-xxxx	Sensor cable M12, 4-pin	Website
ZK700x-xxxx-xxxx	EtherCAT P cable M8	Website

Labeling material, protective caps

Ordering information	Description
ZS5000-0010	Protective cap for M8 sockets, IP67 (50 pieces)
ZS5000-0020	Protective cap for M12 sockets, IP67 (50 pcs.)
ZS5100-0000	Inscription labels, unprinted, 4 strips of 10
ZS5000-xxxx	Printed inscription labels on enquiry

Tools

Ordering information	Description
ZB8801-0000	Torque wrench for plugs, 0.4…1.0 Nm
ZB8801-0001	Torque cable key for M8 / wrench size 9 for ZB8801-0000
ZB8801-0002	Torque cable key for M12 / wrench size 13 for ZB8801-0000
ZB8801-0003	Torque cable key for M12 field assembly / wrench size 18 for ZB8801-0000

● **Further accessories**

i Further accessories can be found in the price list for fieldbus components from Beckhoff and online at https://www.beckhoff.com.

6.3 Version identification of EtherCAT devices

Designation

A Beckhoff EtherCAT device has a 14-digit designation, made up of

- family key
- type
- version
- revision

Example	Family	Type	Version	Revision
EL3314-0000-0016	EL terminal (12 mm, non-pluggable connection level)	3314 (4-channel thermocouple terminal)	0000 (basic type)	0016
ES3602-0010-0017	ES terminal (12 mm, pluggable connection level)	3602 (2-channel voltage measurement)	0010 (high-precision version)	0017
CU2008-0000-0000	CU device	2008 (8-port fast ethernet switch)	0000 (basic type)	0000

Notes

- The elements mentioned above result in the **technical designation**. EL3314-0000-0016 is used in the example below.
- EL3314-0000 is the order identifier, in the case of "-0000" usually abbreviated to EL3314. "-0016" is the EtherCAT revision.
- The **order identifier** is made up of
  - family key (EL, EP, CU, ES, KL, CX, etc.)
  - type (3314)
  - version (-0000)
- The **revision** -0016 shows the technical progress, such as the extension of features with regard to the EtherCAT communication, and is managed by Beckhoff.
  In principle, a device with a higher revision can replace a device with a lower revision, unless specified otherwise, e.g. in the documentation.
  Associated and synonymous with each revision there is usually a description (ESI, EtherCAT Slave Information) in the form of an XML file, which is available for download from the Beckhoff web site. From 2014/01 the revision is shown on the outside of the IP20 terminals, see Fig. *"EL5021 EL terminal, standard IP20 IO device with batch number and revision ID (since 2014/01)"*.
- The type, version and revision are read as decimal numbers, even if they are technically saved in hexadecimal.

Identification number

Beckhoff EtherCAT devices from the different lines have different kinds of identification numbers:

Production lot/batch number/serial number/date code/D number

The serial number for Beckhoff IO devices is usually the 8-digit number printed on the device or on a sticker. The serial number indicates the configuration in delivery state and therefore refers to a whole production batch, without distinguishing the individual modules of a batch.

Structure of the serial number: **KK YY FF HH**

KK - week of production (CW, calendar week)
YY - year of production
FF - firmware version
HH - hardware version

Example with

Ser. no.: 12063A02:   12 - production week 12 06 - production year 2006 3A - firmware version 3A 02 - hardware version 02

Exceptions can occur in the **IP67 area**, where the following syntax can be used (see respective device documentation):

Syntax: D ww yy x y z u

D - prefix designation
ww - calendar week
yy - year
x - firmware version of the bus PCB
y - hardware version of the bus PCB
z - firmware version of the I/O PCB
u - hardware version of the I/O PCB

Example: D.22081501 calendar week 22 of the year 2008 firmware version of bus PCB: 1 hardware version of bus PCB: 5 firmware version of I/O PCB: 0 (no firmware necessary for this PCB) hardware version of I/O PCB: 1

Unique serial number/ID, ID number

In addition, in some series each individual module has its own unique serial number.

See also the further documentation in the area

- IP67: EtherCAT Box
- Safety: TwinSafe
- Terminals with factory calibration certificate and other measuring terminals

Examples of markings

Fig. 20: EL5021 EL terminal, standard IP20 IO device with serial/ batch number and revision ID (since 2014/01)

Fig. 21: EK1100 EtherCAT coupler, standard IP20 IO device with serial/ batch number

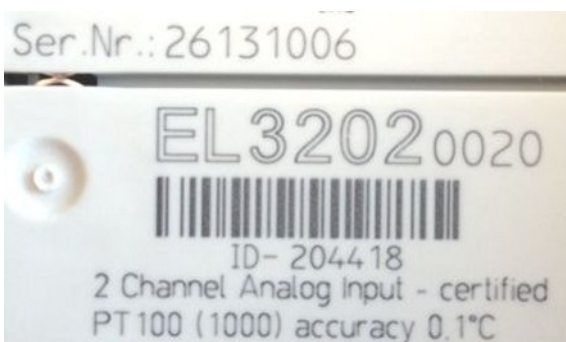Fig. 22: CU2016 switch with serial/ batch number

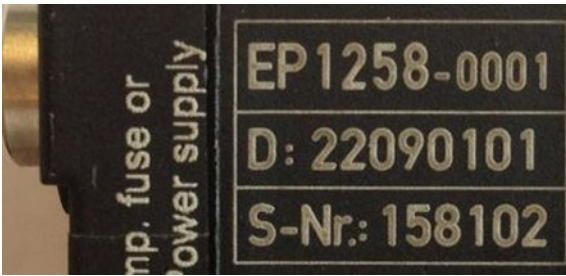Fig. 23: EL3202-0020 with serial/ batch number 26131006 and unique ID-number 204418

Fig. 24: EP1258-00001 IP67 EtherCAT Box with batch number/ date code 22090101 and unique serial number 158102

Fig. 25: EP1908-0002 IP67 EtherCAT Safety Box with batch number/ date code 071201FF and unique serial number 00346070

Fig. 26: EL2904 IP20 safety terminal with batch number/ date code 50110302 and unique serial number 00331701

Fig. 27: ELM3604-0002 terminal with unique ID number (QR code) 100001051 and serial/ batch number 44160201

6.3.1   Beckhoff Identification Code (BIC)

The Beckhoff Identification Code (BIC) is increasingly being applied to Beckhoff products to uniquely identify the product. The BIC is represented as a Data Matrix Code (DMC, code scheme ECC200), the content is based on the ANSI standard MH10.8.2-2016.
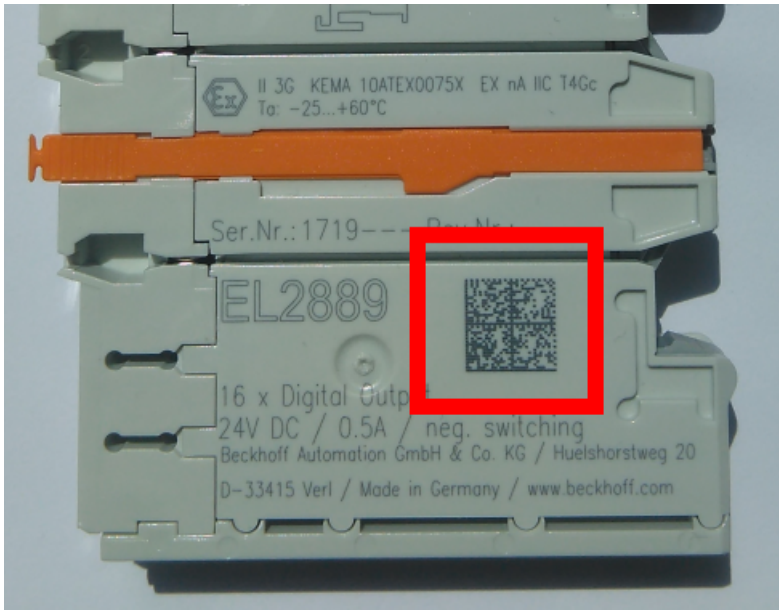

Fig. 28: BIC as data matrix code (DMC, code scheme ECC200)

The BIC will be introduced step by step across all product groups.

Depending on the product, it can be found in the following places:

- on the packaging unit
- directly on the product (if space suffices)
- on the packaging unit and the product

The BIC is machine-readable and contains information that can also be used by the customer for handling and product management.

Each piece of information can be uniquely identified using the so-called data identifier (ANSI MH10.8.2-2016). The data identifier is followed by a character string. Both together have a maximum length according to the table below. If the information is shorter, spaces are added to it. The data under positions 1 to 4 are always available.

The following information is contained:

Item no.	Type of information	Explanation	Data identifier	Number of digits incl. data identifier	Example
1	Beckhoff order number	**Beckhoff order number**	1P	8	1P072222
2	Beckhoff Traceability Number (BTN**)**	**Unique serial number, see note below**	S	12	SBTNk4p562d7
3	Article description	**Beckhoff article description, e.g. EL1008**	1K	32	1KEL1809
4	Quantity	**Quantity in packaging unit, e.g. 1, 10, etc.**	Q	6	Q1
5	Batch number	Optional: Year and week of production	2P	14	2P401503180016
6	ID/serial number	Optional: Present-day serial number system, e.g. with safety products or calibrated terminals	51S	12	51S678294104
7	Variant number	Optional: Product variant number on the basis of standard products	30P	32	30PF971, 2*K183
...					

Further types of information and data identifiers are used by Beckhoff and serve internal processes.

Structure of the BIC

Example of composite information from item 1 to 4 and 6. The data identifiers are marked in red for better display:

BTN

An important component of the BIC is the Beckhoff Traceability Number (BTN, item no. 2). The BTN is a unique serial number consisting of eight characters that will replace all other serial number systems at Beckhoff in the long term (e.g. batch designations on IO components, previous serial number range for safety products, etc.). The BTN will also be introduced step by step, so it may happen that the BTN is not yet coded in the BIC.

NOTE
This information has been carefully prepared. However, the procedure described is constantly being further developed. We reserve the right to revise and change procedures and documentation at any time and without prior notice. No claims for changes can be made from the information, illustrations and descriptions in this information.

6.4   Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

Beckhoff's branch offices and representatives

Please contact your Beckhoff branch office or representative for local support and service on Beckhoff products!

The addresses of Beckhoff's branch offices and representatives round the world can be found on her internet pages: https://www.beckhoff.com

You will also find further documentation for Beckhoff components there.

Beckhoff Support

Support offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with other, wide-ranging services:

- support
- design, programming and commissioning of complex automation systems
- and extensive training program for Beckhoff system components

Hotline: +49 5246 963 157
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Beckhoff Service

The Beckhoff Service Center supports you in all matters of after-sales service:

- on-site service
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- spare parts service
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